Journal of Advances and Scholarly Researches in Allied Education
Vol. 12, Issue No. 2, January-2017, ISSN 2230-7540

A Study on Necrobia Rufipes (Coleoptera, Cleridae), a Pest of Dried Fish

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Abstract – The impact of temperature and photoperiod on the development science, life span, fertility and nourishment consumption of N. rufipes. Studies were additionally completed on the impact of biopesticides on the egg, larval stages and grown-ups of the vermin. A thorough study of the fish drying techniques, the nuisances pervading the dried fish and strategies for control drilled by the fishermen are additionally included. Studies on N.rufipes as a bug of dried fish are immaterial in India and this work may fill in the lacunae somewhat .Dried fish forms a major source of protein in a number of equatorial countries. Dried fishery products frequently suffer severe losses due to infestation by flesh flies (Sarcophagidae), beetles (Dermestes, Cornestes, and Necrobia spp.), and mites (Lardoglyphus and Lyrophagus spp.).Dried fish contaminated by both insects and harmful insecticides comprises about 80 percent of the total dried products that is considered unfit for human consumption. The losses have been attributed to net reductions in the amount of nutrients available to the consumer (nutritive quality) resulting to declining consumer acceptability and market prices (economic losses) or both quantitative and qualitative losses.

Keywords: Fish, Dried, Pest, Cleridae

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1. INTRODUCTION

The gathering of coleopterous creepy crawlies treated here as a full family, the Cleridae, truly has been perceived as numerous taxa. This is a result of the critical morphological variety inside the family. Most species are medium-sized and splendidly shaded (regularly with an aposematic design) red, dark and orange. The couple of little, dull species (Thaneroclerinae) are regularly connected with put away item bugs and are generally appropriated. The subfamilies are somewhat changed in appearance contrasted with different groups of Coleoptera, however are portrayed by wide heads, normally more extensive than the pronotum, the pronotum frequently preferably round and hollow and as a rule smaller over the elytra, a 5-5-5 tarsal recipe with certain individuals clearly with just four tarsal sections, and the whole body secured with fiber like hairs.

A few animal categories are viewed as velvet insect impersonates and others are dared to be a piece of a huge coleopterous mimicry ring including the Lampyridae and Lycidae as summed up models (Mawdsley, 2002: 166). Connections to plant hosts are not emphatically species-explicit. Numerous species have been raised from various plant has. The hydnocerines, assuming any, are the most had some expertise in that they can recreate in nerves and domatia.

Else, they appear to have no smaller plant inclinations than their prey species. Cymatodera, among a couple of other taxa, have been raised from apparently undisturbed larval cells of Hymenoptera. Individuals from the Necrobia are nuisances in certain conditions, yet regularly are possibly present in huge numbers when benefiting from another put away item bug species. Be that as it may, they will 17 feed on shipments of dried meats and some of the time on creature pelts and so forth. Something else, clerids are not bothers. Some taxa are known to control timberland bother populaces and are considered monetarily significant. Thanasimus dubius and T. formicarius are best known for this. Truth be told, T. formicarius was imported by Hopkins (1899) to naturally control timberland irritations of pine and spruce. Most species exhibit wide appropriation and living space go in the eastern United States. Truth be told, the majority of the species which happen in Florida additionally happen in twelve to in excess of twenty different states, with many achieving Canada or Mexico. Among the Florida fauna, just three species are known to be precinctive (= endemic): Callotillus eburneocinctus, Cymatodera floridana, and Chariessa floridana.

One types of faulty status, Phyllobaenus suturalis, is known from Florida and Mexico. The Korynetinae and Tarsosteninae frequently coordinate the circulation of their put away item prey species, which are regularly cosmopolitan. The Cleridae have gotten little consideration as revisionary work, particularly at the family or clan levels. In that capacity, with the end goal of this proposal eight subfamilies are perceived: Clerinae, Enopliinae, Epiphloeinae, Hydnocerinae, Korynetinae, Tarsosteninae, Thaneroclerinae and Tillinae, according to Opitz (2002). Opitz (2007: 79) recommended that it takes a very long time to gather enough material for a "sensible comprehension of intraspecific variety". The rare examples gathered in lesser realized districts further backings the requirement for tolerance in the headway of cleridology. Barr (cited by Opitz) clarified "on numerous occasions I get a shipment and quite often am shocked to discover something absolutely startling as one example, perpetually never to see another of a similar kind".

Accordingly, a few species that have stood depicted for more than twenty years based on a solitary tropical example have never been gathered since (according to perceptions of exhibition hall material after some time).

Fish is one of the shabby and genuinely available creature protein sources. Utilization of fish gives promptly accessible dietary supplements to an enormous number of the general population worldwide and makes an extremely critical commitment to sustenance. Fish is a rich wellspring of lysine, sulfur, amino corrosive and is along these lines reasonable for supplementing high starch diet. Fish is a decent wellspring of thiamine, riboflavin, nutrients An and D, phosphorus, calcium and iron. It is high in polysaturated unsaturated fats which are significant factor for bringing down blood cholesterol level. Smoked dry fish has been affirmed as much supported thing of numerous conventional dishes in Nigeria. As a topping it incredibly enhances the kind of different dishes, it is regularly a decent option in contrast to new fish which in numerous spots is barely accessible. Smoked fish are especially well known in African nations and gave that care is taken in its preparing; it is a decent quality item which can be delivered reasonably and cheaply.

It has been discovered that the all-out healthy benefit of dried fish made a decision from the accessibility of restricting amino acids isn't fundamentally not quite the same as that of the new fish. The impact of fish restoring process without anyone else particularly smoking has no known injurious consequences for the healthful nature of fish. The freedom of specific oils include fragrances and flavor, the smoking procedure increment the general agreeableness of fish to numerous purchasers other than its keeping quality. The loss of water which happens during smoking and drying process normally improves healthfully significant constituents of dried fish and along these lines speaks to an expansion in the centralization of the healthy benefit for the weight obtained. The African mud feline fish Clarias gariepinus (Buchell 1822) is the most famous, broadly developed and for the most part smoked fish in Nigeria.

Notwithstanding, huge scale decay in quality and amount of prepared fish results from creepy crawly pervasion just as from other physical and natural offices. Such misfortunes in eatable material might be viewed as critical healthfully. In Nigeria Dermestes maculatus and Necrobia rufipes were by and large connected with dried fish weakening particularly during its stockpiling, transportation and showcasing stages. Critical misfortunes in quality and amount of smoked Clarias gariepinus during capacity have been ascribed to Dermestes maculatus and other dried fish bothers

2. REVIEW OF LITERATURE

Roesli and Subramanyam, (2002) noticed the red-legged ham creepy crawly (RLHB; Necrobia rufipes), a nuisance of put away items, for example, copra, ham, cheddar, dried fish, and other protein-rich sustenances. N. rufipes overruns different economically significant put away wares in Nigeria and the development of N. rufipes on a few products (dried fish, copra, cacao beans, palm parts, groundnuts, and maize) were contemplated .Development was finished in dried fish (where it was most fast), palm pieces, groundnuts, and copra yet not in cacao beans or maize. Event of N. rufipes harming cashew nut was recorded by .In a review of godowns in Kerala, India, N. rufipes and O. surinamensis were observed to be the most significant irritations.Examinations on bug nuisances of put away oil-palm bits set up the estimation of N. rufipes as a predator. N. rufipes was additionally found in a gallery invading the hole and elastic pieces of the bones of an as of late arranged skeleton of a whale at Kozhikode, Kerala.

An investigation in the market in Ibadan, Nigeria in the period from January 1971 to July 1972 exhibited that Coleoptera, especially Dermestes maculatus (which represented 71.5% of the watched infiltration) and N. rufipes (28.0%), infested a high degree of the dried fish sold. Yet the two species were unlimited reliably, intrusion was most astonishing in the hot dry months and least in the stormy ones. Tribolium castaneum and Trogoderma granarium were found in amazing numbers. (Osuji, 1974).

Fish is a profitable wellspring of brilliant protein contrasting positively and eggs, milk and meat in the dietary benefit of its protein.Fish contains fat, minerals and it is a minor calorie source. In Nigeria, it fills in as a significant wellspring of creature protein just as a wellspring of pay.Its creation, taking care of, preparing and

dissemination give methods for work to a great many individuals just as remote trade profit .The preparing and safeguarding of crisp fish averts financial misfortunes and crumbling of the fish.In Borno State, fish relieving through smoking or drying are the real techniques for conservation. A noteworthy wellspring of harm of relieved fish is bug pervasion. Around fifteen bug bother species have been recorded on relieved fish. Dermestes sp. what's more, Necrobia rufipes establish the significant bugs (Amusan and Okorie, 2002).

Medugu and Kabir Nig. J. Fish. Water 1(1) May, 2013 reason for most unmistakable misfortunes in quality and amount of put away dried fish in Nigeria. Larval phases of D. maculatus represent pervasion of about 93% in dried fish .Different reports demonstrated that about 71.5% of dried fish invasion in the greater part of the delivering regions was brought about .Misfortunes of 13-17% during 3 months' stockpiling of dried fish in Nigeria (caused for the most part by the skin creepy crawly, Dermestes maculatus Degeer, the essential post-collect irritation of dried fish. Huge tonnage (as much as 10,000 tons) of fish particularly types of Clarias, Synodontis and Tilapia are delivered every year in the Lake Chad angling locale.Most examinations concerning these species were given to misfortunes in single fish animal varieties or because of a solitary vermin animal types, as opposed to a similar one. This examination was attempted to evaluate misfortunes in three fish species (smoked) because of D. maculatus and N. rufipes pervasion under research center conditions.

The creepy crawly fauna on put away palm produce was contemplated in Nigeria in a travel shed.The pooter search technique uncovered people of the clerid N. rufipes consistently, in spite of fumigation with phostoxin (aluminum phosphide).

At the point when tests of dried fish of the genera viz. Citharinus, Clarias, Heterotis and Synodontis on special in the market in Ibadan, were inspected the quantities of instances of D. maculatus and N. rufipes discovered per 100 g fish arrived at the midpoint of 6.4 (1.53), 59.5 (24.5), 33.7 (19.2) and 29.5 (9.65), independently . The lipid substance of the models found the center estimation of 12.29, 16.64, 12.87, and 13.42%, for the four genera independently (Osuji, 1974 b). Early distributions on Florida Cleridae were constrained generally to species and family depictions and the easygoing notice of perceptions on conduct, prey species or host plants. The primary huge deals with which included species records numbering in the hundreds. Afterward, similarly as with most creepy crawly taxa, much enlightening work by LeConte, Gorham, Horn, Melsheimer, and Chevrolat added to the known species through the finish of the 1800's. Berenbaum, M. (1985). tended to the hatchlings of North American Cleridae. While there was no revisionary work, a portion of their morphological discourses guarded the family as a steady taxon. Five anonymous subfamilies were proposed, some of which match Opitz's (2002) grouping, others of which just consolidate taxa of comparative body structure. Barr (1962: 121), in a non-revisionary work, recommended just two subfamilies of Cleridae, those being the Clerinae, spoken to by the clans Tillini, Phyllobaenini, Thaneroclerini and Clerini, and the Korynetinae, spoken to by the clans Epiphloeini, Enopliini and Korynetini. Opitz (2002: 268) remarked that the present assignments of supraspecific bunches in Cleridae were exceedingly emotional, frequently missing adequate morphological, atomic and zoogeographical bases.

Odeyemi, O.O. (1997). considered an arrangement where the majority of the clans recorded by Barr (1962) are perceived as subfamilies, in addition to Tarsosteninae, pending further work. Gauges by Papp with regards to the quantity of Cleridae around the world (around 4000, 291 of which happen in the United States). At present, a few inquiries stay unanswered notwithstanding for the North American fauna, where some intraspecific varieties loan interest to the potential sinking or expansion of species. The morphology and conduct of these insects demonstrates potential for mimicry.

3. RESEARCH METHODOLOGY

Maintenance of Stock Culture

A stock culture of N. rufipes was maintained in glass troughs measuring 25cm x 25cm x 11.5cm. in the laboratory on a diet of dried sardine. The original sample was taken from the fish drying centers in Puthiyappa, Calicut. The duration of the present study was from 2004-2006.

Eggs laid by freshly mated females were enclosed in separate specimen tubes (60 in number) measuring 10.5cm X 2.5cm.The tubes were closed with cotton plugs which were soaked with water every 24 hours to provide moisture for the developing larvae. Dried sardine was provided as food and was changed every second day. Observations were made at 24-hour intervals and larval moults were recorded by noting the presence of exuviae.

Fecundity

Freshly emerged males and females were paired in specimen tubes (measuring 10.5cm X 2.5cm). The mated females (20 numbers) were kept individually in the specimen tubes which were closed with cotton plugs. The cotton plugs were soaked with water every day to provide free water for the beetles. Water is provided, as according to Dick

(1937) and Taylor (1964) females with access to free water lay more eggs than with those without and oviposition period is also restricted. Dried sardine (approximately 20 g) was provided as food and oviposition medium.

It was removed at 24 hr. intervals and the eggs were counted and fresh pieces of dried fish were provided. To study multiple mating, male and female were kept together till death and for double mating the male was removed after a single mating. When the females stopped laying eggs, they were mated once again after a gap of 15 days with a freshly emerged male.

Preliminary studies indicated that the females that have stopped laying eggs sometimes resumed egg lying after a maximum gap of 12 days after the first mating. Hence, the gap of 15 days between the two mating.

Longevity

Freshly emerged male and female N.rufipes (20 numbers each) were kept in individually in specimen tubes (measuring 10.5cm X 2.5cm). Dried sardine provided as food was changed every 2nd day. The cotton plugs were soaked with water after every 24 hours to provide moisture for the insects. Observations were made every 24 hours and mortality was recorded.

Courtship And Mating Behaviour

The working area was lined with a clean piece of filter paper. A petri dish (10cm x 2cm) was kept upside down on the filter paper. This was used as the observation arena. A virgin male was introduced under the inverted petridish and was allowed to acclimatize to the surroundings for at least 5 minutes. A virgin female was then introduced. The ensuing sequences of events were carefully observed. If the male and the female did not interact after 2-3 minutes, a different pair was tried. Five such trials were made.

Preparation of Plant Extracts

Water extracts

Leaves were dried under the shade for 1 week and then powdered in a grinder. 25 gm leaf powder was mixed in 100 ml water. Boiled for 2-3 minutes in a 1000 ml conical flask. Strained it with muslin cloth. Squeezed gently. The residue in the muslin cloth was then mixed in 50ml water and boiled for 2-3 minutes. It was again strained and made up to 100 ml. Extracted three times with 100, 50, and 50 ml water to make it 150 ml stock solution.

4. DATA ANALYSIS

The Egg

The egg of N. rufipes has a mean length of 1.5 mm and 0.30 mm width (Plate I, photograph 1). It is tapered and tips are pointed. It is smooth, shining, translucent, and is glued in place. Four eyespots become visible after 24 hours of incubation. The eggshell is torn open by the wriggling movements of the larvae. The incubation period lasts for a mean of 2,13 days (range 2-3 days).

First instar

The first instar larva is delicate, hairy, and pinkish-white (Plate I, photograph 2). Larvae are negatively phototropic. The 1st instar lasts for a mean of 3.19 days (range 3-4 days).

Second instar

Whitish-pink, more hairy, voracious feeder, move fast and prefer crevices (Plate I, photograph 3). The larva eats through the flesh of dried fish resulting in tunnel formation with the remnants of the food and the faecal matter forming the roof of the tunnel. The 2nd instar lasts for a mean of 6.05 days (range 4-7 days).

Third instar

Pinkish-brown body (Plate I, photograph 4). Dorsal side darkly pigmented than the ventral. Hairs are more prominent, and body is narrow andelongated. The third instar larva eats voraciously and makes holes and tunnels during the process of eating. The 3rd instar lasts for a mean of 6.05 days (range 5-10 days).

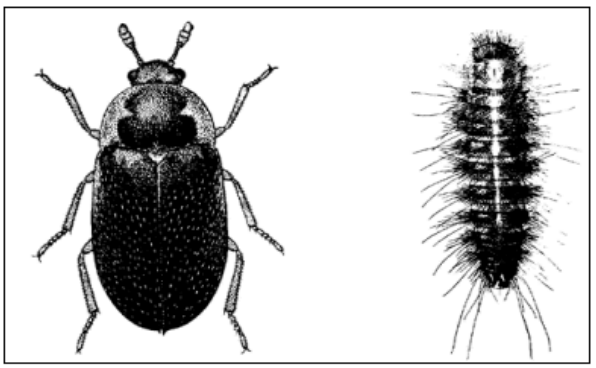

Fig 1 Feeding by larvae and adults of N rufipes causes quantitative

Table 1 Percentage repellency of house flies (Musca domestica) by fish tissue brined with different concentrations of sodium chloride

Percentage Salt Concentration	Control No Salt	Experiment Salted	Total	Percentage Repellency
5%	11.0	5.0	16.0	68.8
10%	11.3	4.3	15.6	72.4
15%	11.7	3.7	15.4	76.0
20%	12.3	2.7	15.0	82.0
25%	14.0	2.3	16.3	85.9
30%	13.0	2.7	15.7	82.8
Total (mean)	73.3 (12.2)	20.7 (3.45)	94 (15.6)	(78.0)

5. CONCLUSION

Field study has demonstrated that insect pervasion is more in the Northern locale (Malappuram, Kozikkode and Kasaragode) of Kerala. Uncontrolled utilization of bug sprays to control the bugs have been seen in the Southern areas (Thiruvananthapuram, Kollam, and Alappuza) of Kerala. Embracing sterile practices will go far in controlling bug pervasion in the field. Drying fish straightforwardly upon sand or free earth as is done at many drying focuses crosswise over Kerala is one of the significant concerns in light of the fact that the hatchlings can tunnel into the sand or earth when temperatures are high and move once again into the fish again once the temperature starts to fall. Where it is beyond the realm of imagination to expect to get the fish dry the ground, clean tangles or sheeting ought to dependably be put underneath the fish to shield it from backhanded pervasion.

Drying the fish on bond stages is another strategy to avoid simple access to N. rufipes and different nuisances The benefit of putting away dried fish in solid sheds with concrete ground surface and all around put dividers and rooftop is that it doesn't give cleft to the bugs to cover up when the shed is cleaned. Such concealing spots will assist the vermin with infesting the new fish stocks.

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