

**RELATIVE ABUNDANCE AND FORAGING ACTIVITY OF SUBTERRANEAN TERMITES IN OLIVE PLANTATIONS IN NOUBARIA REGION, EL-BEHERA GOVERNORATE**

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**BY**

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**ABSTRACT**

The foraging activity of subterranean termites represented as workers and soldiers on corrugated card board traps in four regions cultivated with olive trees was measured in Noubaria region, El-Behera Governorate. Three species of subterranean termites were identified, the harvester termite *Anacanthotermes ochraceus* (Burmeister), the sand termite *Psammodontus hybostoma* (Desneux) and the desert termite *Amitermes desertorum* (Desneux), the number of workers and soldiers were recorded. The average number of termites (workers and soldiers) per trap, and the average number of soldiers per 1000 workers were determined. The population of *A. ochraceus* in the 1<sup>st</sup> region had two peaks (1989 & 1636) in March and October. The population activity of *P. hybostoma* in the 2<sup>nd</sup> region had three peaks; the highest peak was attained in March with (3745) individuals, the moderate peak was in October with (2687) individuals, and the lowest peak was in May with (2492) individuals. The population of *A. desertorum* in the 3<sup>rd</sup> region increased gradually from March and reached its peak (1203) individuals in April then started decline from May to Sept., after that, the population increased again, to reach its other peak (1309) individuals in October, and in the 4<sup>th</sup> region, the population of *A. desertorum* increased gradually from March and reached its peak (1728) individuals in May and started decline from Jun. to Sept., then increased again, to reach its other peak (1129) individuals in October.

**Key words:** activity, corrugated board traps, foraging, population, subterranean termites.

**1. INTRODUCTION**

Subterranean termites have become increasingly important pests of wood trees, horticultural trees and field crops as well as buildings in Egypt; where, the desert and reclaimed lands are irrigated for cultivation. Subterranean termites feed on the alive part of plant such as palm trunk, palm leaves and olive trees (El-Hemaesy, 1976 and Said, 1979). Some species are able to reduce wooden structures to dust, and may cause serious damage to buildings (Rizk *et al.*, 1985). The cryptic nature of subterranean termites makes behavioral studies very difficult and consequently, little is known on their foraging activity (Harris, 1967). Several attempts were however made to determine the foraging behavior of some species of subterranean termites either by applying the soil core method (Wood *et al.*,

1977) or baiting with attractive materials (Lafage *et al.*, 1973; Haverty *et al.*, 1975; Ohiagu and Wood, 1976; Badawi *et al.*, 1984; El-Sebay, 1993 and Ahmed, 2003). The objectives of this work were to study the relative abundance, foraging behavior and identification of subterranean termite species inside the olive plantations.

**2. MATERIALS AND METHODS**

The experiments were carried out in four regions planted with olive trees in Noubaria region, El-Behera Governorate from January 2006 to December 2006. The method devised to observe foraging behavior involved cleaning the dead wood from ground, where, all superficial and partially buried dead debris were removed from the four regions to prevent any nutrient interferences with the applied traps. Two hundred rolls of corrugated card board traps

were prepared in the laboratory, where, wrapped in roll shape (12 cm high and 5-7cm in diameter) and sent to the experimental regions. Traps were distributed all over the experimental regions (50 trap/site) and aligned as 5 columns and 10 rows with 2 meters intervals between olive trees. Traps were wet with water before buried in holes (15 cm depth in soil). The polyethylene sheaths appeared above the soil being a marking sign for traps. Corrugated board traps served as a food source and humidity which attracted the termites to the surface. To check for subterranean termites foraging activity, each trap was removed from its hole, shaken into a plastic container to remove all individuals of termites hanging to the bottom and inside of the trap. Subterranean termite individuals were counted by using a fine hair brush, sorted into castes, and identified. Each roll trap was then placed back to its hole, severely attacked traps were replaced by new ones. After two weeks of collecting, termite species was kept for each trap involved the number of workers and soldiers of termite species, and determined the date of first attack, and the average number of soldiers per 1000 workers (S/W ratio) for each species in each region. Identification of the collected termites in all regions was made by using the available termite Keys (Harris, 1967; Fontes, 1985; Myles 1998 ; Sands 1998 and Myles, 2004).

### 3. RESULTS AND DISCUSSION

Data in Table (1) show that the species of *A. ochraceus* was first recorded in Feb. The foraging activity of *A. ochraceus* in region 1 increased gradually from Feb. to reach its first peak (1989) workers and soldiers in March and started to decline in April, May, June, and July. The foraging activity increased gradually again from August to reach its second peak (1639) workers and soldiers in October, then decreased through the remaining months. The species of *P. hybostoma* was first recorded in January, the population activity of *P. hybostoma* in region 2 had three peaks, the highest two peaks were attained in March and October with (3745 and 2687) workers and soldiers, respectively, the other peak was in May with (2492) workers and soldiers. In region No. 3, the species of *A.*

*desertorum* was first recorded in March, its population increased gradually from March and its peak (1203) workers and soldiers in May and started decline from May to Sept., then increased again to reach other peak (1309) workers and soldiers in October, then decline gradually during the remaining months; the species of *P. hybostoma* was first recorded in Feb.; its population increased gradually from Feb. to March and started declined during April and May, then increased gradually from June to reach its peak (2362) workers and soldiers in October; the foraging activity decreased again through the remaining months. In region 4, the species of *A. desertorum* was first recorded in March, its population increased gradually from March to April to reach its peak ( 1728) workers and soldiers in May and started decline from Jun. to July., then increased again to reach other peak (1129) workers and soldiers in October, then decline gradually during the remaining months. (Ghoniemy *et al.* 1999) found that, the foraging activity of *A. ochraceus* increased gradually from January to reach its peak ( 1289 ) individuals in April then decreased sharply to disappear in June and increased again in the subsequent two months, decreased in Sept., then increased gradually during the remaining months. El-Bassyouni (2001) mentioned that, the largest individuals of foraged workers of *P. hybostoma* were during winter, while the least one was during summer season. Ahmed (2003) mentioned that, the foraging activity of *P. hybostoma* peaked in two periods, the first and highest one peaked in the period from 25 March to 6 May, while the second period of activity peaked at 5 November.

Data in Table (2) show that, in region No. 1, the number of attacked traps by species *A. ochraceus* increased gradually from February to April and started decline from May, up to August , then increased again to reach its peak in October and declined again in the remaining months. Number of attacked traps by species *P. hybostoma* in regions 2 increased gradually from January to April then declined from May to August, and increased gradually from September to reach its peak in October, and decreased again in the remaining months. The number of attacked traps by *A.*

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**Table (1): Population of workers and soldiers collected from attacked traps in four regions throughout the experimental period.**

| Date of inspection | Regions            |            |                     |            |                     |            |                      |           |                      |           |
|--------------------|--------------------|------------|---------------------|------------|---------------------|------------|----------------------|-----------|----------------------|-----------|
|                    | 1                  |            | 2                   |            | 3                   |            | 4                    |           | 4                    |           |
|                    | <i>A.ochraceus</i> |            | <i>P. hybostoma</i> |            | <i>P. hybostoma</i> |            | <i>A. desertorum</i> |           | <i>A. desertorum</i> |           |
|                    | W                  | S          | W                   | S          | W                   | S          | W                    | S         | W                    | S         |
| Jan.               | 0                  | 0          | 121                 | 3          | 0                   | 0          | 0                    | 0         | 0                    | 0         |
| Feb.               | 265                | 13         | 267                 | 5          | 986                 | 21         | 0                    | 0         | 0                    | 0         |
| Mar.               | 1989               | 23         | 3745                | 31         | 1256                | 19         | 118                  | 2         | 463                  | 3         |
| Apr.               | 1596               | 21         | 2193                | 26         | 278                 | 3          | 623                  | 2         | 862                  | 5         |
| May                | 427                | 9          | 2492                | 17         | 296                 | 5          | 1203                 | 5         | 1728                 | 6         |
| Jun.               | 295                | 5          | 1318                | 19         | 485                 | 2          | 579                  | 2         | 711                  | 3         |
| Jul.               | 112                | 6          | 1109                | 11         | 621                 | 5          | 311                  | 3         | 289                  | 2         |
| Aug.               | 193                | 7          | 861                 | 18         | 1082                | 13         | 221                  | 2         | 325                  | 1         |
| Sept.              | 738                | 8          | 1153                | 21         | 1213                | 16         | 256                  | 1         | 549                  | 3         |
| Oct.               | 1639               | 23         | 2687                | 41         | 2362                | 42         | 1309                 | 2         | 1129                 | 7         |
| Nov.               | 648                | 20         | 1191                | 25         | 916                 | 4          | 274                  | 3         | 438                  | 3         |
| Dec.               | 172                | 7          | 1456                | 13         | 531                 | 14         | 61                   | 1         | 49                   | 1         |
| <b>Total</b>       | <b>8074</b>        | <b>142</b> | <b>16193</b>        | <b>230</b> | <b>10017</b>        | <b>135</b> | <b>4955</b>          | <b>23</b> | <b>6516</b>          | <b>34</b> |

**Table (2): Number of corrugated board traps attacked by three subterranean termites in four regions throughout the experimental period.**

| Date of inspection | Number of infested corrugated traps |                     |                     |                      |                      |
|--------------------|-------------------------------------|---------------------|---------------------|----------------------|----------------------|
|                    | Regions                             |                     |                     |                      |                      |
|                    | 1                                   | 2                   | 3                   | 4                    | 4                    |
|                    | <i>A.ochraceus</i>                  | <i>P. hybostoma</i> | <i>P. hybostoma</i> | <i>A. desertorum</i> | <i>A. desertorum</i> |
| Jan                | 0                                   | 3                   | 0                   | 0                    | 0                    |
| Feb.               | 8                                   | 9                   | 4                   | 0                    | 0                    |
| March              | 24                                  | 18                  | 15                  | 26                   | 15                   |
| April              | 38                                  | 41                  | 12                  | 32                   | 22                   |
| May                | 27                                  | 33                  | 18                  | 29                   | 16                   |
| Jun                | 21                                  | 28                  | 34                  | 13                   | 7                    |
| July               | 7                                   | 19                  | 25                  | 8                    | 4                    |
| August             | 4                                   | 14                  | 12                  | 11                   | 3                    |
| Sept.              | 22                                  | 22                  | 28                  | 16                   | 14                   |
| Oct.               | 39                                  | 44                  | 21                  | 9                    | 25                   |
| Nov.               | 23                                  | 26                  | 17                  | 15                   | 6                    |
| Dec.               | 2                                   | 5                   | 4                   | 8                    | 1                    |
| <b>Total</b>       | <b>215</b>                          | <b>262</b>          | <b>190</b>          | <b>167</b>           | <b>113</b>           |

Total applied corrugated traps were 50 per region per month

**Table (3): Distribution and foraging activity of *Anacanthotermes ochraceus*, *Psammotermes hybostoma* and *Amitermes desertorum* in four regions planted with olive trees in Noubaria, El-Behera Governorate.**

| No. of regions | Termites species                            | Number of workers & soldiers | Number of soldiers | Number of attacked traps | Termites per trap | Soldiers/1000 Workers |
|----------------|---|------------------------------|--------------------|--------------------------|-------------------|-----------------------|
| 1              | <i>A.ochraceus</i>                          | 8074                         | 142                | 215                      | 37.55             | 17.58                 |
| 2              | <i>P. hybostoma</i>                         | 16193                        | 230                | 262                      | 61.80             | 14.20                 |
| 3              | <i>P. hybostoma</i><br><i>A. desertorum</i> | 10017<br>4955                | 135<br>23          | 190<br>167               | 52.72<br>29.67    | 13.47<br>4.64         |
| 4              | <i>A. desertorum</i>                        | 6156                         | 34                 | 113                      | 57.66             | 5.21                  |

*desertorum* in region 3 increased gradually from March to reach its peak in April, then declined from May to August, and fluctuated from September to December. Number of attacked traps by *P. hybostoma* ranged from 4 in February to 18 in May and reach its peak in June, then fluctuated from July to December. The peak of numbers attacked trap by species *A. desertorum* in region 4 was in October, while the least one was 0 in January and February, then increased gradually from March to April and declined from May to August, then increased again in September to reach its peak in October and decline again in the remaining months.

Obtained data in Table (3) showed that, subterranean termites species, were recorded in four regions planted with olive trees at various levels of infestation, were harvester termites *Anacanthotermes ochraceus* (Burmeister), (Fam.: Hodotermitidae) in region No.1, sand termites *Psammotermes hybostoma* (Desneux) (Fam.: Rhinotermitidae) in two regions No.2&3, and desert termites *Amitermes desertorum* (Desneux) (Fam.: Termitidae). in two regions No.3&4. Regions 1,2 and 4 were each infested with a single subterranean termites species; two species *P. hybostoma* and *A. desertorum* were found in region No.3. The total number of all individuals (workers & soldiers) ranged from (4955) in *A. desertorum* to (16193) in *P. hybostoma*. The total number of soldiers ranged from 23 individuals (4.64%) of all individuals in *A. desertorum* to 230 individuals (14.20%) of all individuals in *P. hybostoma*; these numbers were collected from (113 to 262) corrugated traps with range of (29.67 to 61.80) termites individuals per trap. The number of individuals termites per trap in this study was higher than those recorded previously by Hosny & Saïd (1980); Badawi *et al.* (1984). Differences in the ratio of soldiers /1000 workers among different subterranean termite species indicated that, *A. ochraceus* had ratios of (17.58) in region No.1, the ratio of *P. hybostoma* reached (14.20) and (13.47) in regions No.2&3 respectively. The ratio of *A. desertorum* reached ( 4.64 ) and (5.21) in regions No.3&4, respectively. Badawi *et al.*, (1984), found that, ratios of (26.4) and (16.4) were recorded for *Amitermes villis*, and

*Amitermes* sp., lower ratio of (6.2) was recorded for *Anacanthotermes*,. Susan *et al.*, (1981), showed that, the ratios differ between colonies of the wood inhabiting termites *Pterotermes occidentus*, where the largest colony had a high ratio of 1:41 and two smaller colonies had low ratios of 1:85 and 1:96, respectively.

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الوفرة النسبية ونشاط السروح للنمل الأبيض تحت الأرضي في مزارع الزيتون في منطقة التوباريه  
محافظة البحيرة

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ملخص

استهدفت هذه الدراسة إمكانية قياس نشاط السروح للنمل الأبيض تحت الأرضي وذلك من خلال استخدام المصائد الكرتونية المضلعه حيث وزعت هذه المصائد في أربعة مواقع داخل زراعات أشجار الزيتون. هذا وقد تم تعريف ثلاثة أنواع من النمل الأبيض تحت الأرضي وهما: النمل الأبيض الحاصد *Psammotermes hybostoma* (Burmeister) ونمل الرمال *Anacanthtermes ochraceus* (Desneux) ونمل الصحارى *Amitermes desertorum* (Desneux) وبينت الدراسة وجود فروق واضحة ما بين عدد المصائد المصابة بالنمل الأبيض تحت الأرضي وتعداد الشغالات والجنود؛ وقد تم تقدير متوسط تعداد النمل الأبيض لكل مصيدة كرتونية وعدد الجنود لكل ١٠٠٠ شغاله ولوحظ تواجد النوع *A. ochraceus* في المنطقة الأولى حيث سجلت قمتين لتعداد النوع *A. ochraceus* ( ١٦٣٦ & ١٩٨٩ ) في مارس وأكتوبر بينما كان تعداد النوع *P. hybostoma* ممثل بثلاث قمم للنشاط ( ٣٧٤٥ ؛ ٢٦٨٧ ؛ ٢٤٩٢ ) في مارس وأكتوبر ومايو على الترتيب وذلك في المنطقة الثانية والثالثة وفي المنطقة الثالثة كان هناك قمة واحدة للنشاط ( ١٢٠٣ ) لتعداد النوع *A. desertorum* في أبريل بينما كان لنفس النوع قمتين للنشاط ( ١٧٢٨ & ١١٢٩ ) في مايو وأكتوبر في المنطقة الرابعة ثم قل النشاط تدريجياً ابتداء من شهر يونيه إلى شهر سبتمبر.

المجلة العلمية لكلية الزراعة - جامعة القاهرة - المجلد (٥٨) العدد الرابع (أكتوبر ٢٠٠٧): ٢٨٥-٢٨٠.