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عدد الفقرات كصفة مرستيقية لسمكى الستس نيرس والستس باريموز

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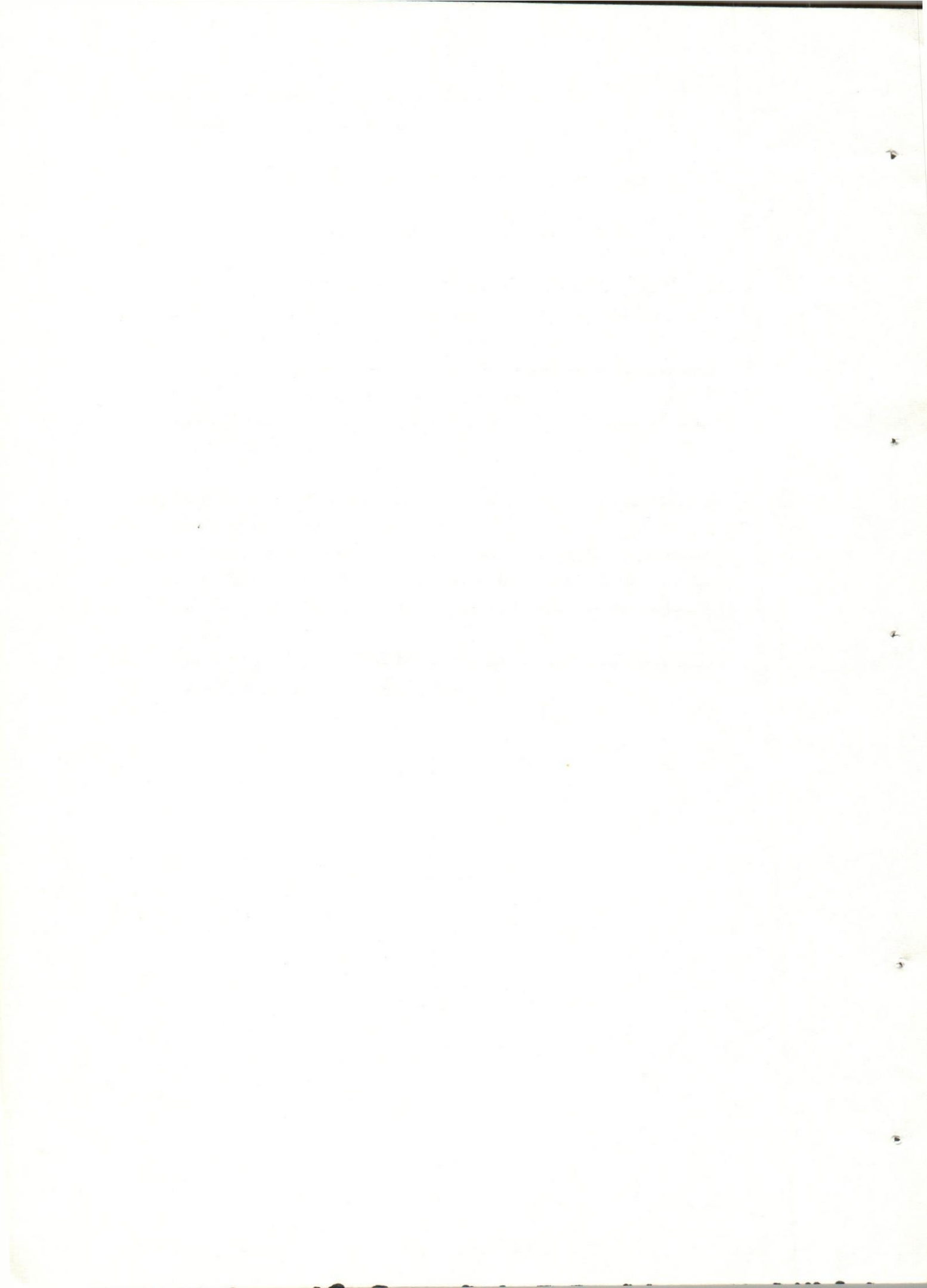
يتضمن هذا البحث دراسة على عدد الفقرات - كصفة مرستيقية - لسمكى الستس نيرس والستس باريموز فى منطقة أسيوط ومقارنة جماعات النوع الأول بجماعات من نفس النوع فى منطقة أسوان من وجهة نظر تلك الصفة المرستيقية ومن أهم نتائج هذا البحث :

١- فى منطقة أسيوط يختلف العدد الكلى للفقرات باختلاف الجنس فى جماعات الستس نيرس ولا يوجد مثل هذا الأختلاف فى جماعات نفس النوع فى منطقة أسوان .
٢- فى منطقة أسيوط لم يتغير العدد الكلى للفقرات فى الجماعات خليطة الجنس لسمة الستس نيرس من عام الى آخر .

٣- الأختلاف فى العدد الكلى للفقرات لجماعات الستس نيرس فى أسيوط عنه فى أسوان يرجع أساسا الى الأختلاف فى عدد الفقرات البطنية .

٤- تختلف جماعات الستس نيرس فى منطقة أسيوط عن جماعات نفس النوع فى أسوان من حيث العدد الكلى للفقرات وعدد كل من الفقرات البطنية والفقرات الذيلية إلا أن هذا الأختلاف لا يرقى بأى من هذه الجماعات الى مستوى النوع ولذلك اعتبرت هذه الجماعات منعزلة جغرافيا .

٥- أوضح هذا البحث أن العدد الكلى للفقرات صفة مرستيقية ذات قيمة تقسيمية عالية ويمكن بواسطتها التفريق بين الستس نيرس والستس باريموز .



VERTEBRAL COUNT AS A MERISTIC CHARACTER OF TWO NILE CHARCOID FISHES,
ALESTES NURSE AND ALESTES BAREMOSE
(With 18 Tables)

By

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SUMMARY

Assiut samples of Alestes nurse revealed sexual dimorphism as regards their total vertebral counts, whereas Aswan ones did not. The total vertebral counts of Assiut combined sex samples of A. nurse did not vary from year to year. Variation of the total vertebral counts of Assiut and Aswan samples of A. nurse was mainly due to the variation of abdominal vertebral counts; variation in caudal vertebral counts had little contribution in this respect. The total, abdominal and caudal vertebral counts revealed that Assiut and Aswan combined sex samples of A. nurse represented geographical races and not a subspecific status. The total vertebral count proved to be reliable for the differentiation between A. nurse and A. baremose since they were widely different and did not vary according to the total length.

INTRODUCTION

Vertebral count, as a meristic character, has long been used for fish systematics (BJERKAN, 1940; A. Dannevig, 1941 and 1950; G. DANNEVIG, 1951; SEYMOUR, 1959; QUAIST, 1964; RAFAIL, 1970; DURAND and LOUBENS, 1972 and WINTERBOTTOM, 1980). In a previous investigation, KHALIL *et al.* (in press) studied certain meristics, other than vertebrae, of two Nile charcoïd fishes, Alestes nurse and Alestes baremose. In the present investigation, vertebral count as a meristic character of those fish species will be considered.

MATERIAL and METHODS

A total of 568 specimens of Alestes nurse (74-247 mm in total length) and 47 specimens of Alestes baremose (227-600 mm in total length) were randomly collected from Assiut fish markets during the period May 1977-June 1979; also, 524 specimens of A. nurse (83-176 mm in total length) were randomly collected from Aswan fish markets during July and August 1978.

Vertebral column preparations were made by boiling the fish in water, removing the flesh carefully by a forceps and clearing in 1-2% KOH for a suitable time. The total, abdominal and caudal vertebrae were counted for each specimen. The posterior abdominal vertebrae, each of which had a bony ridge connecting the parapophyses with each other at a small distance from the centrum, were counted separately from the anterior abdominal ones. The aforementioned vertebral counts were carried out for Assiut and Aswan male, female and combined sex samples of A. nurse and only for combined sex samples of A. baremose due to the rarity of its specimens during the period of collection. The data of different vertebral counts were subjected to analyses of variance and covariance and Chi-square test according to SIMPSON *et al.* (1960). The coefficient of difference (C.D.) for total, abdominal and caudal vertebral counts of Assiut and Aswan populations of A. nurse was calculated as prescribed by MAYR *et al.* (1953). According to them, C.D. values equal to 1.28 and higher are considered indicative of subspecific status. At that value, 90% of the fish in each of the two populations being compared differ from one another.

RESULTS

Alestes nurse

The percentages of occurrence of total, abdominal and caudal vertebral counts of Assiut and Aswan male, female and combined sex samples of A. nurse are summarized in Tables 1-3. These tables show that such percentages

varied according to sex and locality. Table 4 presents the percentage of occurrence of the anterior and posterior abdominal vertebral counts of Assiut combined sex samples of A.nurse. Table 5 reveals the variation of the ranges of abdominal and caudal vertebral counts of Assiut and Aswan combined sex samples of A.nurse according to the total vertebral counts. The variation of the ranges of anterior and posterior abdominal vertebral counts of Assiut combined sex samples according to the total vertebral counts is shown in Table 6.

The distribution of total vertebral counts of samples belonging to different sexes, year classes and localities is given in Table 7. Only one sample out of 14 samples of A.nurse obtained from Assiut revealed sexual dimorphism as regards the total vertebral count ($\chi^2 = 4.947$; d.f. = 1; $P = 0.05-0.02$), but the accumulative information ($\chi^2 = 38.63$; d.f. = 35; $P = 0.75-0.50$) failed to give evidence of sexual dimorphism in that connection. This result indicates that each sample has to be testified for sexual dimorphism because accumulative information from several samples may give misleading information in that connection. Pooling the data of each of male and female samples was possible since such samples were found to be homogeneous during the two year classes considered ($\chi^2 = 14.825$; d.f. = 32; $P > 0.99$). The results of the pooled data revealed that the sex affected the total vertebral count of those samples ($\chi^2 = 23.805$; d.f. = 3; $P < 0.001$). One can therefore conclude that pooling the data of each of the males and females of different samples is much better for testifying sexual dimorphism than accumulative information.

All Aswan samples of A.nurse showed that there was no association between sex and total vertebral count (Table 7); also, the accumulative information showed insignificant differences ($\chi^2 = 23.74$; d.f. = 19; $P = 0.25-0.10$). Pooling of data was possible, since Aswan male and female samples were found to be homogeneous ($\chi^2 = 15.679$; d.f. = 14; $P = 0.50-0.30$). The pooled data revealed no association between sex and total vertebral counts of those samples ($\chi^2 = 8.061$, d.f. = 5; $P = 0.20-0.10$).

The distribution of total vertebral counts of Assiut and Aswan combined sex samples of A.nurse is summarized in Table 8. The variability of such counts within localities and between year classes is given in Table 9 from which it could be concluded:

- 1- Assiut combined sex samples of A.nurse within the year class 1978 were not homogeneous ($0.01 > P > 0.001$), whereas such samples within the year class 1979 ($0.80 > P > 0.70$) and Aswan combined sex samples within the year class 1978 ($0.30 > P > 0.20$) were found to be homogeneous. Accordingly, Assiut samples within the year class 1978 which were collected through a long range of time represented different local population. On the other hand, each of Assiut samples within the year class 1979 and Aswan samples within the year class 1978 which were collected through a short range of time were considered as belonging to the same population.
- 2- The total vertebral counts of Assiut combined sex samples of A.nurse did not vary significantly from year to year ($0.70 > P > 0.50$).
- 3- The total vertebral counts of Assiut combined sex samples of A.nurse within the year class 1978 were highly significantly different from those of Aswan ones ($P < 0.001$). Accordingly, Assiut and Aswan samples represented isolated populations.

Table 10 shows the average of total vertebral counts of Assiut and Aswan combined sex samples at 10 mm length group intervals. When these results were subjected to analysis of variance (Table 11) no correlation between the total vertebral counts and total length of the fish was revealed.

Analysis of variance revealed that the mean value of the abdominal vertebral counts of Assiut combined sex samples of A.nurse was significantly different from that of Aswan ones. ($F = 1201.194$; d.f. = 1, 1097; $P < 0.01$). Also, there was a significant difference between the means of the caudal vertebral counts of Assiut and Aswan combined sex samples ($F = 65.176$; d.f. = 1, 1097; $P < 0.01$). A comparison of the aforementioned F values revealed that the variation of the total vertebral counts of Assiut and Aswan combined sex samples was mainly due to the variation of the abdominal vertebral count; variation in the caudal vertebral count contributed to a less extent in this respect.

VERTEBRAL COUNT AS A MERISTIC CHARACTER

Alestes baremose:

The percentages of occurrence of total, abdominal, caudal, anterior abdominal and posterior abdominal vertebral counts of combined sex samples of A. baremose are given in Table 12-14. No correlation was found between the total vertebral count and total length of the fish. The ranges of abdominal, caudal, anterior abdominal and posterior abdominal vertebral counts of combined sex samples of A. baremose were found to vary according to the total vertebral count (Tables 15 and 16).

DISCUSSION

The correlation between the fish size and number of vertebrae was the focus of research of some investigators. BJERKAN (1940) reported the presence of a positive correlation between the fish size and number of vertebrae within the same samples of sprat of the 0 group. A similar correlation was reported by TANING (1944) in sea trout and by A. DANNEVIG (1950) in plaice. The aforementioned authors attributed such correlation to the external conditions prevailing during the early stages which might influence the number of vertebrae. According to BJERKAN (1940), the larger sprat were somewhat older than the smaller ones; they hatched earlier in the season under lower temperatures and therefore had a higher number of vertebrae. However, A. DANNEVIG (1941) pointed to the possibility that in addition of external factors, hereditary factors might be also of importance. According to him, the correlation between the size of the fish and the number of vertebrae might partly be a constitutional genetic characteristic, i.e. great capability of growth was linked with a higher number of vertebrae. In the present investigation, the species considered did not reveal any correlation between the fish size and number of vertebrae.

In the present investigation, Assiut samples of A. nurse within the year class 1978 revealed sexual dimorphism as regards their total vertebral counts. DURAND and LOUBENS (1972) reported that the average total vertebral counts of females of Alestes baremose was about 1/3 higher than that of males.

In the present investigation, variation of the total vertebral counts of Assiut and Aswan samples of A. nurse was mainly due to the variation of abdominal vertebral counts; variation in caudal vertebral counts had little contribution in this respect. QUAIST (1964) raised the question whether meristic variation finds its expression in the entire series of meristic elements or whether it is concerned mainly with variation in the number of terminal elements, as indicated by HUBBS and HUBBS (1945); FORD (1937) believed that variation in the terminal vertebrae was the usual cause of variation in vertebral count. However, SEYMOUR (1959) found nearly equal frequencies of abnormal number of vertebrae in both caudal and precaudal regions of the vertebral column of experimentally reared shinroach salmon.

In the present investigation, the total vertebral counts of Assiut combined sex samples of A. nurse did not vary significantly from year to year. G. DANNEVIG (1951) reported that in each year there may be significant differences between the average number of vertebrae of sprat samples from the Norwegian waters. RAFAIL (1971) noticed the presence of year to year variations in the vertebral counts of Sardinella Jussieu. He interpreted such variations to be due to variations in the physical environment during spawning and early developmental stages. By contrast, that author found that the vertebral counts of Sardinella sirm did not change from year to year in the same locality and he attributed this result to the relative insensitivity of vertebral number of that species to environmental factors during the critical early stages of development.

In the present investigation, the results of total, abdominal and caudal vertebral counts revealed that Assiut and Aswan combined sex samples of A. nurse represented isolated populations. However, the coefficient of difference (C.D.) between such counts of those samples did not attain the value of 1.28. Accordingly, samples of A. nurse from those localities did not represent a subspecific status; they could be only considered as geographical races or isolates.

In the present investigation, the total vertebral counts proved to be reliable for the differentiation between A. nurse and A. baremose since they were widely different and did not vary according to the total length. Using total vertebral counts, WINTERBOTTOM (1980) was able to differentiate between Pseudanos gracilis, Pseudanos

irinae and Pseudanos trimaculatus.

A comparison of the total, precaudal (abdominal) and caudal vertebral counts of A.nurse and A.baremore of the present investigation with those reported by BOULENGER (1907) revealed some variations (Tables 17 and 18). Such variations may be due to the rarity of specimens examined by Boulenger, variations of environmental factors prevailing nowadays in the Nile as compared with those of the time of Boulenger, adaptive changes of genetic nature or all these factors.

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Table (1): Percentage of occurrence of total vertebral counts of males and females of A. nurse off Assiut and Aswan.

| Vertebral count | Assiut | | | | Aswan | | | |
|--------------------|----------------|-------|----------------|-------|----------------|-------|----------------|-------|
| | Males | | Females | | Males | | Females | |
| | No. of fish | % | No. of fish | % | No. of fish | % | No. of fish | % |
| 34 | | | | | | | 1 | 0.2 |
| 35 | | | | | 1 | 0.61 | 6 | 1.67 |
| 36 | | | | | 13 | 7.93 | 37 | 10.28 |
| 37 | 23 | 7.57 | 14 | 5.3 | 91 | 55.49 | 214 | 59.44 |
| 38 | 210 | 69.08 | 138 | 52.27 | 57 | 34.76 | 90 | 25 |
| 39 | 65 | 21.38 | 100 | 37.88 | 2 | 1.21 | 12 | 3.33 |
| 40 | 6 | 1.97 | 12 | 4.55 | | | | |
| $\bar{X} + S.D.$ | 38.18±0.581 | | 38.42±0.665 | | 37.28±0.651 | | 37.17±0.741 | |

VERTEBRAL COUNT AS A MERISTIC CHARACTER

Table (2): The percentage of occurrence of total vertebral counts of *A. nurse* (combined sexes) off Assiut and Aswan.

| Vertebral count | Assiut | | Aswan | |
|--------------------|-------------------|-------|-------------------|-------|
| | No. of fish | % | No. of fish | % |
| 34 | | | 1 | 0.19 |
| 35 | | | 7 | 1.34 |
| 36 | | | 50 | 9.54 |
| 37 | 37 | 6.51 | 305 | 58.21 |
| 38 | 348 | 61.27 | 147 | 28.05 |
| 39 | 165 | 29.05 | 14 | 2.67 |
| 40 | 18 | 3.17 | | |
| $\bar{X} \pm S.D.$ | 38.29 \pm 0.632 | | 37.21 \pm 0.715 | |

Table (3): The percentage of occurrence of abdominal and caudal vertebral counts of *A. nurse* (combined sexes) off Assiut and Aswan.

| No. of vertebrae | Abdominal | | | | Caudal | | | | |
|--------------------|-------------------|-------|-------------------|-------|-------------------|-----|-------------------|------|-------|
| | Assiut | | Aswan | | Assiut | | Aswan | | |
| | No. of fish | % | No. of fish | % | No. of fish | % | No. of fish | % | |
| 14 | | | 6 | 1.13 | 14 | | 1 | 0.19 | |
| 15 | | | 18 | 3.38 | 15 | 26 | 4.58 | 10 | 1.88 |
| 16 | 12 | 2.12 | 285 | 53.57 | 16 | 268 | 47.27 | 145 | 27.25 |
| 17 | 161 | 28.39 | 206 | 38.72 | 17 | 246 | 43.39 | 310 | 58.27 |
| 18 | 331 | 58.38 | 16 | 3.01 | 18 | 27 | 4.76 | 66 | 12.41 |
| 19 | 63 | 11.11 | 1 | 0.19 | | | | | |
| $\bar{X} \pm S.D.$ | 17.78 \pm 0.659 | | 16.39 \pm 0.669 | | 16.48 \pm 0.661 | | 16.81 \pm 0.673 | | |

Table (4): The percentage of occurrence of anterior abdominal and posterior abdominal vertebral counts of *A. nurse* (combined sexes) off Assiut.

| No. of vertebrae | Anterior abdominal | | Posterior abdominal | | |
|--------------------|--------------------|-------|---------------------|-------------|-------|
| | No. of fish | % | No. of vertebrae | No. of fish | % |
| 12 | 9 | 1.59 | 2 | 3 | 0.53 |
| 13 | 261 | 46.11 | 3 | 60 | 10.60 |
| 14 | 262 | 46.30 | 4 | 320 | 56.54 |
| 15 | 33 | 5.83 | 5 | 176 | 31.09 |
| 16 | 1 | 0.17 | 6 | 7 | 1.24 |
| $\bar{X} \pm S.D.$ | 13.57 \pm 0.636 | | 4.22 \pm 0.664 | | |

Table (5): The variation of the ranges of abdominal and caudal vertebral counts with the variation of total vertebral counts of *A. nurse* (combined sexes) off Assiut and Aswan

| Total vertebral counts | Assiut | | | Aswan | | |
|------------------------|-------------|-----------------|--------------|-------------|-----------------|--------------|
| | No. of fish | abdominal range | caudal range | No. of fish | abdominal range | caudal range |
| 34 | | | | 1 | 14 | 16 |
| 35 | | | | 8 | 14 - 17 | 14 - 17 |
| 36 | 1 | 16 | 16 | 51 | 14 - 17 | 15 - 18 |
| 37 | 37 | 16 - 17 | 15 - 17 | 307 | 15 - 18 | 15 - 18 |
| 38 | 353 | 16 - 19 | 15 - 18 | 151 | 16 - 18 | 16 - 18 |
| 39 | 161 | 17 - 19 | 16 - 18 | 14 | 17 - 19 | 16 - 18 |
| 40 | 15 | 18 - 19 | 17 - 18 | | | |
| Total range | | 16 - 19 | 15 - 18 | | 14 - 19 | 14 - 18 |

Table (6): The variation of the ranges of anterior and posterior abdominal vertebral counts with the variation of total vertebral counts of *A. nurse* (combined sexes) off Assiut

| Total vertebral counts | No. of fish | Anterior abdominal range | Posterior abdominal range |
|------------------------|-------------|--------------------------|---------------------------|
| 36 | 1 | 13 | 3 |
| 37 | 37 | 12 - 15 | 2 - 5 |
| 38 | 353 | 12 - 15 | 2 - 6 |
| 39 | 161 | 13 - 16 | 3 - 6 |
| 40 | 15 | 13 - 15 | 4 - 6 |
| Total range | | 12 - 16 | 2 - 6 |

VERTEBRAL COUNT AS A MERISTIC CHARACTER

Table (7): Distribution of total vertebral counts of male and female samples of *A. nurse* off Assiut and Aswan

| Date and locality | Sex | Vertebral numbers | | | | | | | Total | χ^2 for sex | d.f. | P |
|-------------------|--------|-------------------|----|----|-----|----|-----|-----|-------|---------------------|-------------------|----------------------|
| | | 34 | 35 | 36 | 37 | 38 | 39 | 40 | | | | |
| Assiut: | | | | | | | | | | | | |
| 30-3-78 | Male | | | | | 9 | 2 | 1 | 12 | | | |
| | Female | | | | | 3 | 2 | 3 | 8 | 20 | 3.333 | 2 0.20-0.10 |
| 16-5-78 | Male | | | | 3 | 12 | 4 | - | 19 | | | |
| | Female | | | | - | 4 | 2 | - | 6 | 25 | 1.24 | 2 0.70-0.50 |
| 12-6-78 | Male | | | | - | 12 | 1 | - | 13 | | | |
| | Female | | | | 1 | 5 | 4 | 1 | 11 | 24 | 6.55 | 3 0.10-0.05 |
| 24-6-78 | Male | | | | 2 | 4 | 3 | 1 | 10 | | | |
| | Female | | | | - | 4 | 4 | - | 8 | 18 | 2.95 | 3 0.50-0.30 |
| 25-6-78 | Male | | | | 1 | 10 | 4 | - | 15 | | | |
| | Female | | | | - | 3 | 2 | - | 5 | 20 | 0.581 | 2 0.80-0.70 |
| 28-8-78 | Male | | | | - | 4 | 1 | - | 5 | | | |
| | Female | | | | - | 3 | 10 | - | 13 | 18 | 4.947 | 1 0.05-0.02 |
| 29-8-78 | Male | | | | 3 | 14 | 10 | - | 27 | | | |
| | Female | | | | 3 | 26 | 20 | 1 | 50 | 77 | 1.167 | 3 0.80-0.70 |
| 28-9-78 | Male | | | | 3 | 46 | 12 | 1 | 62 | | | |
| | Female | | | | 2 | 11 | 3 | 1 | 17 | 79 | 2.150 | 3 0.70-0.50 |
| 1-11-78 | Male | | | | 1 | 14 | 6 | 2 | 23 | | | |
| | Female | | | | 2 | 12 | 12 | 1 | 27 | 50 | 2.516 | 3 0.50-0.30 |
| 13-1-79 | Male | | | | 1 | 2 | 1 | - | 4 | | | |
| | Female | | | | 1 | 8 | 5 | - | 14 | 18 | 0.97 | 2 0.70-0.50 |
| 14-1-79 | Male | | | | 2 | 8 | 2 | - | 12 | | | |
| | Female | | | | - | 6 | 5 | 1 | 12 | 24 | 4.57 | 3 0.30-0.20 |
| 4-2-79 | Male | | | | 3 | 29 | 8 | - | 40 | | | |
| | Female | | | | 3 | 26 | 20 | 2 | 51 | 91 | 6.067 | 3 0.20-0.10 |
| 6-3-79 | Male | | | | 2 | 24 | 7 | 1 | 34 | | | |
| | Female | | | | 1 | 18 | 9 | 2 | 30 | 64 | 1.528 | 3 0.70-0.50 |
| 27-3-79 | Male | | | | 2 | 22 | 4 | - | 28 | | | |
| | Female | | | | 1 | 9 | 2 | - | 12 | 40 | 0.061 | 2 $P > 0.90$ |
| Aswan: | | | | | | | | | | | | |
| 8-7-78 | Male | | | | - | 3 | 13 | 8 | - | 24 | | |
| | Female | | | | 2 | 6 | 26 | 5 | 2 | 41 | 65 | 5.99 4 0.20 |
| 12-7-78 | Male | | | | - | 1 | 3 | 16 | 13 | 1 | 34 | |
| | Female | 1 | 2 | | 8 | 50 | 20 | 4 | 85 | 119 | 3.436 | 5 0.70-0.50 |
| 24-7-78 | Male | | | | 2 | 17 | 12 | - | 31 | | | |
| | Female | | | | 10 | 26 | 12 | 2 | 50 | 81 | 5.035 | 3 0.20-0.10 |
| 30-7-78 | Male | | | | - | 5 | 14 | 13 | 1 | 33 | | |
| | Female | | | | 2 | 6 | 50 | 22 | 3 | 83 | 116 | 5.040 4 0.30-0.20 |
| 7-8-78 | Male | | | | - | 31 | 11 | - | 42 | | | |
| | Female | | | | 7 | 62 | 31 | 1 | 101 | 143 | 4.239 | 3 0.30-0.20 |
| Pooled data | | | | | | | | | | | | |
| a-Assiut | Male | | | | | 23 | 210 | 65 | 6 | 304 | | |
| | Female | | | | | 14 | 138 | 100 | 12 | 264 | 568 | 23.805 3 $P > 0.001$ |
| b-Aswan | Male | | | | 1 | 13 | 91 | 57 | 2 | 164 | | |
| | Female | 1 | 6 | 37 | 214 | 90 | 12 | | 360 | 524 | 8.061 5 0.20-0.10 | |

Table 8: The distribution of total vertebral counts of Assiut and Aswan combined sex samples of A. nurse.

| Date | Locality | Vertebral number | | | | | | | Total number | Average number | S.D. |
|---------|----------|------------------|----|----|----|----|----|----|--------------|----------------|-------|
| | | 34 | 35 | 36 | 37 | 38 | 39 | 40 | | | |
| 30-3-78 | Assiut | - | - | - | - | - | - | - | 20 | 38.60 | 0.821 |
| 16-5-78 | Assiut | 3 | 16 | 6 | 4 | 4 | 4 | 4 | 25 | 38.12 | 0.600 |
| 12-6-78 | Assiut | 1 | 17 | 5 | 1 | 1 | 1 | 1 | 24 | 38.25 | 0.610 |
| 24-6-78 | Assiut | 2 | 17 | 7 | 7 | 1 | 1 | 1 | 18 | 38.39 | 0.777 |
| 25-6-78 | Assiut | 1 | 13 | 8 | 6 | 6 | 6 | 6 | 20 | 38.25 | 0.550 |
| 28-8-78 | Assiut | - | - | - | - | - | - | - | 18 | 38.61 | 0.501 |
| 29-8-78 | Assiut | 6 | 40 | 30 | 12 | 12 | 12 | 12 | 79 | 38.34 | 0.570 |
| 28-9-78 | Assiut | 5 | 57 | 15 | 15 | 15 | 15 | 15 | 77 | 38.42 | 0.700 |
| 1-11-78 | Assiut | 3 | 26 | 18 | 3 | 3 | 3 | 3 | 50 | 38.18 | 0.646 |
| 13-1-79 | Assiut | 2 | 10 | 7 | 7 | 7 | 7 | 7 | 24 | 38.29 | 0.690 |
| 14-1-79 | Assiut | 2 | 14 | 28 | 1 | 1 | 1 | 1 | 91 | 38.29 | 0.619 |
| 4-2-79 | Assiut | 6 | 55 | 28 | 6 | 6 | 6 | 6 | 64 | 38.29 | 0.634 |
| 27-3-79 | Assiut | 3 | 42 | 16 | 2 | 2 | 2 | 2 | 64 | 37.08 | 0.474 |
| 8-7-79 | Assiut | 3 | 31 | 13 | 6 | 6 | 6 | 6 | 65 | 37.08 | 0.768 |
| 12-7-78 | Aswan | 1 | 11 | 66 | 33 | 33 | 33 | 33 | 119 | 37.22 | 0.775 |
| 24-7-78 | Aswan | 3 | 12 | 43 | 24 | 24 | 24 | 24 | 81 | 37.19 | 0.714 |
| 30-7-78 | Aswan | 2 | 11 | 64 | 35 | 35 | 35 | 35 | 116 | 37.24 | 0.742 |
| 7-8-78 | Aswan | - | - | 7 | 93 | 42 | 42 | 42 | 143 | 37.26 | 0.553 |

Table 9: Variability of total vertebral counts of A. nurse (combined sexes) within and between localities and between year classes.

| Comparison | X ² | d.f. | P |
|--------------------------------------------------------------------------|----------------|------|------------|
| | | | |
| 1-Homogeneity of samples within localities and within year classes(Y.C.) | | | |
| a- Assiut, Y.C. 1978 | 43.497 | 24 | 0.01-0.001 |
| b- Assiut, Y.C. 1979 | 8.672 | 12 | 0.80-0.700 |
| c- Aswan, Y.C. 1978 | 19.754 | 16 | 0.30-0.200 |
| 2-Within locality and between year classes. | | | |
| Assiut, Y.C. , 1978, 1979 | 1.955 | 3 | 0.70-0.500 |
| 3-Within year classes and between localities. | | | |
| Aswan and Assiut Y.C.,1978 | 365.474 | 5 | P < 0.001 |

Table 10: Average number of total vertebrae at 10 mm length group intervals of Assiut and Aswan combined sex samples of A. nurse.

| Length group (mm) | Assiut | | | Aswan | | |
|-------------------|-------------|-----------------------------|--------------------|-------------|-----------------------------|--------------------|
| | No. of fish | Average number of vertebrae | Standard deviation | No. of fish | Average number of vertebrae | Standard deviation |
| 80 | - | - | - | 6 | 37.93 | 0.753 |
| 90 | 11 | 38.27 | 0.467 | 25 | 36.92 | 0.702 |
| 100 | 15 | 38.26 | 0.457 | 45 | 37.18 | 0.684 |
| 110 | 33 | 38.21 | 0.739 | 114 | 37.19 | 0.751 |
| 120 | 85 | 38.27 | 0.696 | 189 | 37.17 | 0.652 |
| 130 | 148 | 38.26 | 0.535 | 31 | 37.24 | 0.708 |
| 140 | 127 | 38.29 | 0.679 | 6 | 37.55 | 0.661 |
| 150 | 93 | 38.26 | 0.690 | 3 | 37.50 | 1.049 |
| 160 | 66 | 38.32 | 0.660 | 3 | 36.67 | 0.577 |
| 170 | 43 | 38.11 | 0.589 | - | - | - |
| 180 | 19 | 38.11 | 0.459 | - | - | - |
| 190 | 6 | 38.33 | 0.516 | - | - | - |
| 200 | 8 | 38.50 | 0.534 | - | - | - |
| 210 | 4 | 38.50 | 0.577 | - | - | - |
| 220 | - | - | - | - | - | - |

Table 11: Analysis of variance of total vertebral counts of A. nurse off Assiut and Aswan to show the correlation between those counts and the fish length.

| | Assiut | Aswan |
|---------------------------------------|---------|--------|
| S ₁ ² | 0.4007 | 0.485 |
| S ₂ ² | 0.1663 | 0.826 |
| F | 0.4150 | 1.700 |
| d.f. ₁ , d.f. ₂ | 645, 11 | 502, 8 |

S₁² = Within-groups mean square.
S₂² = Deviation from linearity mean square.

Table 12: The percentage of occurrence of total vertebral counts of A. baremose off Assiut.

| Vertebral count | 46 | 48 | 49 | 50 | Total |
|--------------------|-------------------|-------|-------|------|-------|
| No. of fish | 1 | 8 | 20 | 2 | 31 |
| % | 3.23 | 25.81 | 64.51 | 6.45 | |
| $\bar{X} \pm S.D.$ | 48.71 \pm 0.739 | | | | |

Table 13: The percentages of occurrence of abdominal and caudal vertebral counts of A. baremose off Assiut.

| No. of vertebrae | Abdominal | | Caudal | |
|--------------------|-------------------|-------|--------------------------------------|-------------|
| | No. of fish | % | No. of vertebrae | No. of fish |
| 19 | 2 | 7.14 | 22 | 2 |
| 20 | 8 | 28.57 | 23 | 7 |
| 21 | 12 | 42.86 | 24 | 12 |
| 22 | 5 | 17.86 | 25 | 7 |
| 23 | 1 | 3.57 | | |
| $\bar{X} \pm S.D.$ | 20.82 \pm 0.945 | | $\bar{X} \pm S.D.$ 23.86 \pm 0.891 | |

Table 14: The percentages of occurrence of anterior and posterior abdominal vertebral counts of A. baremose off Assiut.

| No. of vertebrae | Anterior abdominal | | Posterior abdominal | |
|--------------------|--------------------|-------|--------------------------------------|-------------|
| | No. of fish | % | No. of vertebrae | No. of fish |
| 13 | 1 | 3.57 | 5 | 3 |
| 14 | 17 | 60.71 | 6 | 12 |
| 15 | 8 | 28.57 | 7 | 11 |
| 16 | 2 | 7.14 | 8 | 2 |
| $\bar{X} \pm S.D.$ | 14.39 \pm 0.685 | | $\bar{X} \pm S.D.$ 6.43 \pm 0.7902 | |

Table 15: Variation of the range of abdominal and caudal vertebral counts according to the total vertebral count of A. baremose (Combined sexes) off Assiut.

| Total vertebral count | No. of fish | Abdominal vertebral count range | Caudal vertebral count range |
|-----------------------|-------------|---------------------------------|------------------------------|
| 46 | 1 | 20 | 22 |
| 48 | 8 | 19 - 21 | 23 - 25 |
| 49 | 17 | 20 - 23 | 22 - 25 |
| 50 | 2 | 21 - 22 | 24 - 25 |

Table 16: Variation of the range of anterior and posterior abdominal vertebral counts according to the total vertebral count of A. baremose (combined sexes) off Assiut.

| Total vertebral count | No. of fish | Anterior abdominal vertebral count range | Posterior abdominal vertebral count range |
|-----------------------|-------------|------------------------------------------|-------------------------------------------|
| 46 | 1 | 14 | 6 |
| 48 | 8 | 13 - 14 | 5 - 7 |
| 49 | 17 | 14 - 16 | 5 - 8 |
| 50 | 2 | 14 - 15 | 7 |

Table 17: Comparison of some meristic characters of A. nurse recorded in the present work with similar data recorded by Boulenger (1907).

| Meristic characters | Count range | |
|---------------------|-----------------------|--------------------------------|
| | Assiut fish 1978-1979 | Aswan fish 1978 Boulenger 1907 |
| Total vertebrae | 37 - 40 | 34 - 39 |
| Precaudal vertebrae | 20 - 23 | 18 - 23 |
| Caudal vertebrae | 15 - 18 | 14 - 18 |

Table 18: Comparison of some meristic characters of A. baremose recorded in the present work with similar data recorded by Boulenger (1907).

| Meristic characters | Count range | |
|---------------------|-------------------------|----------------|
| | Assiut fish 1978 - 1979 | Boulenger 1907 |
| Total vertebrae | 46 - 50 | 49 - 51 |
| Precaudal vertebrae | 23 - 27 | 25 - 28 |
| Caudal vertebrae | 22 - 25 | 23 - 24 |

