EFAN Report 2-2000

3rd International Ageing Workshop
on European Anglerfish

IPIMAR, Lisbon, 8-12 March 1999

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1. INTRODUCTION

Black (*Lophius budegassa*) and White (*Lophius piscatorius*) Anglerfish are two important species of groundfish fisheries in the North East Atlantic. They are evaluated annually at the ICES Working Group on the Assessment of the Southern Shelf Demersal Stocks.

In the last two decades several studies on age reading and growth of North Eastern Atlantic and Mediterranean Anglerfish have been carried out (Anon, 1991; Anon., 1998a; Azevedo, 1996; Crozier, 1989; Duarte *et al.,* 1997; Dupouy and Kergoat, 1985; Dupouy *et al.,* 1986; Landa and Pereda, 1997; Landa *et al.,* 1998; Pereda and Landa, 1998; Peronnet, *et.al.*, 1992; Quincoces *et al.,* 1998 (a, b); Tsimenidis, 1984 and Tsimenidis and Ondrias, 1980).

The Workshop on Sampling Strategies for Age and Maturity (ICES CM, 1994) indicated that it is necessary to convene a specific workshop on age determination when the results of the stock assessment research suggest inconsistencies in the data or whenever new inexperienced staff becomes involved with those age determinations. For these reasons, it was deemed necessary to convene workshops on Anglerfish age determination.

The first ageing Workshop for Anglerfish was carried out in 1991 (Anon., 1991) involving readers from France and Spain. In 1997 (Anon., 1998) a second workshop was conducted with additional participation by Portugal. These Workshops were considered to be the first steps in trying to achieve a consensus in ageing criteria on Anglerfish.

This Workshop (3rd) is undertaken as part of the EU Study Contract No.97/015 ("New assessment and biology of the main commercial fish species: Hake and Anglerfishes of the Southern shelf demersal stocks in South Western Europe – DEMASSESS"). The workshop can also be considered within the main objectives of the European Fish Ageing Network (EFAN), which "aims to develop, conduct and co-ordinate collaborative research and training, and thereby ensure that age determination becomes a reliable element of the assessment underlying the scientific management advice on fisheries and environmental resources". Participants from various institutes who were present at the previous workshop participated in this, the 3rd workshop. In addition two personnel from the MIFRC, Dublin participated in an Angler fish Ageing Workshop for the first time. Prior to this workshop an *illicia* exchange was carried out with participation of all institutes.

The workshop was structured in the following way for each species:

- Analysis and discussion of the exchange (1st reading) results

- Discussion on ageing criteria

- 2nd readings performed on a sub-sample

- Analysis and discussion of the 2nd reading results

- Final discussion on ageing criteria

- Preparation of the report

2. OBJECTIVES OF THE WORKSHOP

The objectives of the 3rd International Ageing Workshop on European Anglerfish (*L. budegassa* and *L. piscatorius*) are to:

- Analyse and discuss the results of the age determination based on the *illicia* exchange, in order to clarify the main problems of Anglerfish age reading

- Continue the work started in the Workshops held in 1991 and 1997 and improve agreement between readers

- Elaborate ageing criteria based on agreement between readers

- Introduce new readers from countries involved in the assessment of Anglerfish, to age determination of the species

3. PARTICIPANTS

Manuela Azevedo	IPIMAR - Lisbon	Portugal
Rafael Duarte – Chairman	IPIMAR - Lisbon	Portugal
Hervé Dupouy	IFREMER - Lorient	France
Bernard Kergoat	IFREMER - Lorient	France
Jorge Landa	IEO - Santander	Spain
Paulino Lucio	AZTI - Sukarrieta	Spain
Helen McCormick	MIFRC - Dublin	Ireland
Cristina Morgado	IPIMAR - Lisbon	Portugal
Iñaki Quincoces	AZTI - Sukarrieta	Spain
Fiona Woods	MIFRC - Dublin	Ireland
Asier Zamakona	AZTI - Sukarrieta	Spain

Addresses of participants are in Annex 1.

4. MATERIAL AND METHODS

4.1. *Illicia* reading

4.1.1. Samples

First reading (exchange)
Two *illicia* collections from each of the two species were prepared for the exchange. The ageing-structures included in the sets were randomly sorted from different length classes.

The *L. budegassa* collections totalling 138 *illicia*, consisted of 70 *illicia* from the Northern Stock (ICES Div. VIIIa,b,d) prepared by AZTI from commercial sampling and 68 *illicia* from the Southern Stock (ICES Div. VIIIc and IXa) prepared by IPIMAR from commercial sampling and demersal surveys. The Southern collection also contained some corresponding second dorsal fin rays. The *illicia* selected for both collections covered a length range between 15 and 88 cm (Figure 1) over a one-year sampling period.

The *L. piscatorius* collections totalling 147 *illicia*, consisted of 73 *illicia* from the Northern Stock (ICES Div. VIIIa,b,d) prepared by AZTI from commercial sampling and 74 *illicia* from the Southern Stock (ICES Div. VIIIc and IXa) prepared by IEO from commercial sampling. The *illicia* selected for both collections covered a length range between 19 and 140 cm (Figure 2).

Second reading
After a discussion on ageing criteria a random subsample of 35 *illicia* from each species were chosen. The *illicia* were selected from the Northern collections and represented the total length range (Figures 1a and 2a).

4.1.2. Age reading

Eight readers participated in both the exchange and workshop but not all of the readers read both Northern and Southern collections due to insufficient time being available. The reader codes, names and expertise of the readers who participated in the *illicia* exchange are presented in the following table.

Code	Reader	*Lophius budegassa*		*Lophius piscatorius*	
		Northern Collection	**Southern Collection**	**Northern Collection**	**Southern Collection**
R1	Iñaki Quincoces	***	***	***	***
R2	Asier Zamakona	**	**	**	**
R3	HelenMcCormick	*	No participation	*	*
R4	Fiona Woods	*	No participation	*	*
R5	Jorge Landa	***	***	***	***
R6	Hervé Dupouy	No participation	***	***	No participation
R7	Bernard Kergoat	No participation	**	**	No participation
R8	Rafael Duarte	***	***	**	**

* Readers with no experience
** Readers with experience
*** Expert readers

A protocol, by species (Annex 2, 3), was prepared in advance of the exchange and circulated amongst readers. This gave information on the collection preparation, ageing and measurement methodology and a time schedule for ageing amongst readers.

First reading (exchange)

The observation of the *illicia* was carried out using an optical microscope under transmitted light with x100 magnification, for the most part. R3 and R4 did not have access to a microscope with x100 magnification and therefore age reading was performed using the maximum magnification available to them, which was x50. Information on the total length and the time of capture of each specimen was given to the readers. Wherever possible each reader attributed an age to each *illicium* and gave information about the ageing credibility and the first ring measurements. The age credibility was classified according to one of four levels of readability (U – unreadable; L - low; M - medium; H – high). The ring diameter was measured in micrometres (μm) in two perpendicular directions. For the first ring measurements some readers used a calibrated eyepiece whilst others used an image analysis system. The latter system is more precise than the former and this fact should be taken into account when interpreting the results. R3 and R4 extrapolated their first ring measurements to x100 magnification. When the readers attributed more than one age to the same *illicium*, the first age was considered. For the Southern *L. budegassa* collection, reading was also performed on the 2nd dorsal ray, when present.

Second reading

For the second reading of the *Illicia*, some microscopes were set at a higher magnification than the recommended x100 (due to the combined magnification of their component parts). This was thought to be a possible source of error in the age interpretation of the *illicia*. It was generally thought that this influence may have been stronger with respect to the second age readings of the *L. piscatorius* samples, whereby the poorest microscopes were excluded and each reader used only one microscope to read all samples. Those readers who read at a higher magnification (x125 or higher) may have been susceptible to this source of error. When the second reading of *L. budegassa* was performed, samples were located at specific microscopes, thus all readers read the same samples with the x125 microscopes and the influence, if any, of varying levels of magnification would at least have been, homogeneously distributed between all the readers.

The light sources for some microscopes were adjustable whilst others were not. Those readers who used the microscopes with fixed light sources may have been working at a disadvantage. As in the first reading, the total length and the catch date for each *illicium* was available to the readers. Wherever possible each reader attributed an age to each *illicium* and gave information regarding the ageing credibility using the same parameters as in the first reading. It should be noted and taken into consideration when analysing the results, that second readings of both species were performed under the pressure of limited time.

4.1.3. Data analysis

Prior to the analysis of the data, all ageing results were observed. From this, it was decided that *illicia* from *L. budegassa* having three or more "Low" or "Unreadable" credibility levels assigned to them, should be excluded from the exchange results analysis. If the inexperienced readers made up one or more of these, then the modal ages amongst the remaining readers were observed and if there was high agreement, these *illicia* were not excluded. For the exchange results of *L. piscatorius* and for the second reading of both species, all *illicia* were considered in the analysis.

Several methods have been used up to the present time to analyse the results of these exchanges such as tests to examine between-reader bias: the paired t-test, the Bowker´s test of symmetry and the Wilcoxon rank sum test (ICES CM, 1994). Nevertheless, these methods are considered inappropriate in performing multiple paired comparisons when more than two readers are involved in ageing the same collection, which is the case in this exchange (Azevedo, in prep.). To compare levels of agreement between groups of readers (test the reproducibility of the results from ageing structures, stocks or preparation methods), the average percent error (APE) from Beamish and Fournier (1981), the index of precision (D) from Chang (1982) and the chance-corrected measure from O´Connell and Dobson (1984) have been proposed. It should be stressed that the aforementioned measures of agreement, although computed in this report, must be interpreted with caution since they have been criticised as not providing an appropriate measure of ageing agreement between readers.

It was decided that an exploratory analysis should be the first step in analysing the results, as recommended in the ICES CM (1994). Exploratory analysis was performed by collection. The statistical analysis consisted of computing agreement and variability measures.

Exploratory data analysis:
The modal age was determined based on the expert reader's results (see Table on page 4). For each *illicium* the difference between the readers age and the modal age was calculated. Following the methodology described by Eltink (1994) the average age was plotted against the modal age for each reader and for all readers combined. In the case of the first readings of *L. piscatorius* (Southern collection), there were only two expert readers involved in calculating the modal age and so whenever they differed on the age of an *illicium*, this piece of data was totally excluded from the analysis, which resulted in a large reduction of data. Therefore it was decided to use the modal age based on readers with experience (all readers excluding R3 and R4) when producing the bias plots.

A box-whisker plot (mean, mean±std. dev., mean±1.96std. dev.) of all ages attributed by readers was produced. A cluster analysis was performed using euclidean distances and single linkage. Readers were linked according to the attributed ages.

Ageing credibility percentages were calculated by reader for all collections.

For the first ring diameter analysis, the average diameter for *L. budegassa* and the horizontal and vertical diameters for *L. piscatorius* were calculated by reader and by age. This information was plotted by reader in box-whisker plots and by reader and age in a line graph. The nucleus and first ring of *L. piscatorius* have a characteristic oblong shape which means the larger and smaller axis diameters are very different, therefore it is not appropriate to calculate the average between them, as with *L. budegassa*. The analysis was based only on the largest axis because it is the wider measurement and differences between readers are probably more noticeable. In this report, the largest axis of the first ring of *L. piscatorius* is also called the "horizontal diameter".

Statistical data analysis:
The following measures were determined:
The average percent error (APE) (Beamish and Fournier, 1981):

$$APE\,(\%) = \frac{100}{n} \sum_{i=1}^{n} \left(\frac{1}{r} \sum_{j=1}^{r} \frac{\left| x_{ij} - \overline{x}_i \right|}{\overline{x}_i} \right)$$

where,
n = number of *illicia*
r = number of readers for each *illicium*
x_{ij}= the j value of age estimation for the *illicium* i
$\overline{x}_i$ = average age calculated for the *illicium* i

The mean coefficient of variation (CV):
where,

$$CV = \frac{\sum_{i=1}^{n} \frac{s.d._i}{\overline{x}_i}}{n}$$

$s.d._i$ = standard deviation calculated for the *illicium* i.

The index of precision (D) (Chang, 1982):

$$D = \frac{\sum_{i=1}^{n} \frac{CV}{\sqrt{r}}}{n}$$

Analyses were performed using Statistica software (StatSoft, Inc., 5.1) and Excel (Microsoft 97) spreadsheets.

4.2. Age reading criteria

For the discussion of the age reading criteria a projector was used to project the image magnified by the microscope, onto a screen. Any alteration in the image focus or lighting could be directly observed on the screen. In this way, each reader could show their personal reading method (focusing, lighting and ring counting) and discussion would follow. For each image shown on the screen each reader identified the annual rings according to the ageing criteria they were using. When initial agreement was not reached between readers, agreement was sought through communal discussion. From numerous discussions, a list of the main peculiarities associated with *illicia* reading was produced and is presented in Chapter 7 of this report.

5. RESULTS OF THE AGE READINGS

5.1. *Lophius budegassa*

5.1.1. First reading (exchange)

The ageing results obtained by reader and basic information about the *illicia,* for each collection, are presented in Tables 1 and 2.

Northern collection
The exploratory analysis shows that the ages attributed by R3 and R4 are very different from the other readers (Tables 3 and 4, Figures 3a, 4 and 5). These two readers present large differences between the age attributed and the modal age. In Figure 3b it can be seen that the average of all readers ages are underestimated relative to the modal age and that deviations increase with age.

Considering the bias plots for readers R1, R2, R5 and R8 together (Figure 3c), it can be observed that the mean age is very close to the modal age and that deviations do not increase with age.

The statistical analysis shows that when readings from R3 and R4 are excluded, better results are obtained and the APE, CV and D decrease (Table 5).

Ageing credibility percentages calculated for each reader are given in Table 6. Although results are different between readers, it can be observed that, in general the "Medium" credibility level has the highest percentage.

The box-whisker plot of the first ring diameter shows two main groups: one consisting of the expert readers R1, R5 and R8 and another consisting of the non expert readers R2, R3 and R4 (Figure 6). The average diameters of the expert readers are similar and lower than 100 μm, whilst the non expert readers attain average values higher than 150 μm (R2) and 200 μm (R3 and R4). The graphical representation of the average 1st ring measurement by age for each reader (Figure 7) clearly illustrates that expert readers present similar average diameters for all ages. On the other hand, 1st ring measurements by R2 increase with age and the measurements of R3 and R4 are twice that of other readers. According to the expert readers, the 1st ring diameter should be approximately 100 μm for this species.

Southern collection
For this collection, the exploratory data analysis shows that the average ages are close to the modal ages for all readers (Figure 8). From Tables 7 and 8 it can be seen that even in older age groups, agreement between readers is high.

R2 seems to have some discrepancies relative to the other readers. In Figure 8a this reader shows higher mean ages in the older age groups. The same is observed in Figure 9 where the mean age and standard deviation of R2 are higher compared to the other readers.

The cluster analysis shows that R1, R5, R6, R7 and R8 are linked in a narrower group and R2 is separated from this group (Figure 10).

From the statistical analysis (Table 9) it can be seen that the APE, CV and D indices, for all readers, are much lower than those of the Northern collection. If only expert readers are considered in the present analysis, the value of the indices decreased slightly.

The credibility analysis (Table 6) shows that "Medium" and "Low" credibility levels present higher percentages.

R2 gives larger measurements for the 1st ring diameter compared to other readers (Figure 11) and seems to increase this parameter in older ages (Figure 12). As with the Northern collection, the first ring diameter from specimens in the Southern collection seems to be around 100 μm.

5.1.2. Second reading

The results obtained for the second reading are presented in Table 10. An overall improvement in ageing is observed, since readers R3 and R4 are close to the other readers (Tables 11 and 12, Figures 13, 14 and 15). The values of the indices computed, are lower than those for the first readings (Table 5). The APE decreased from 36% in the first reading to 10% in the second, taking all readers into consideration. By excluding R3 and R4, no improvement was observed (10% in the first and second readings).

5.2. *Lophius piscatorius*

5.2.1. First reading (exchange)

The ageing results obtained by reader and basic information about the *illicia*, for each collection, are presented in Tables 13 and 14.

Northern collection
Considering the modal ages obtained from expert readers, the exploratory analysis shows that the ages attributed by R3 and R4 are substantially different from those attributed by other readers, presenting large differences to the modal age (Tables 15 and 16, Figure 16). The bias plots for readers R1, R2, R5 and R6 (Figure 16a), show that the mean age is very close to the modal age and deviations are small.

The box-whisker plots of the mean ages by reader show two main groups: one which consists of the expert (R1, R5, R6) and partially experienced readers (R2, R7, R8) and another which consists of the non experienced readers (R3, R4) (Figure 17).

The dendrogram obtained from cluster analysis point out the presence of two clear groups: one group consisting of R3 and R4 and another, which includes all the remaining readers (Figure 18). Euclidean distances indicate that R3 and R4 are distinctly separated from the other readers.

The statistical analysis shows that if R3 and R4 are excluded, significantly better results are obtained, the APE, CV and D decreasing considerably (Table 17).   No substantial differences are observed when comparing results from all readers, for the 1st and 2nd semester.

Ageing credibility percentages by reader are given in Table 18. Differences are observed between readers with the "Medium" credibility level appearing most frequently.

Average "first horizontal ring diameter" by reader, is presented in Figure 19. R2 and R3 show higher values than the other readers. The measurements that R5 and R8 presented are very similar and are lower than the mean values of R1, R6 and R7.

The average "horizontal diameters" of the expert readers (R1, R5, R6) are between 200 and 250 μm, with the extreme mean values at 180 μm (R8 and R5) and higher than 400 μm (R2).

The graphical representation of the average fist ring ("horizontal diameter") by age for each reader (Figure 20) indicates again that expert readers are closer to each other presenting similar average diameters, especially in the lower ages (<15 years). On the

other hand, R2 presents increasing ring measurements with age, twice that of the other readers. R3 shows increasing ring measurements from ages 1 to 8.

Southern collection
Modal ages were obtained from all readers excluding R3 and R4. As observed in the Northern collection, the exploratory analysis shows that the ages attributed by R3 and R4 differ substantially from other readers and present large differences to the modal age (Figure 21a and Table 19 and 20). R8 presents some remarkable differences to the modal age but only in the higher ages. Considering the bias plots for readers R1, R2 and R5, it appears that the mean ages are very close to the modal ages and deviations are low (Figure 21a). In Figure 21b the mean ages for all readers combined are underestimated relative to the modal ages. Deviations are very high and increase with age.

The box-whisker plots of the ages clearly show two different groups: one composed of the expert (R1 and R5) and experienced readers (R2 and R8) and another composed of the non experienced readers (R3 and R4) (Figure 22).

The dendrogram obtained from the cluster analysis points out the presence of two clear groups (Figure 23). One group consists of R3 and R4 and another consists of the remaining readers. These two groups are clearly separated.

The statistical analysis shows that when only expert readers are considered (R1, R5 and R8), significantly better results are obtained and the APE, CV and D decrease considerably (Table 21). Good results are also obtained if all readers, excluding R3 and R4, are considered. No substantial differences are observed when comparing results from first and second semester for all readers.

A box-whisker plot of the 1st "horizontal ring diameter" (Figure 24) confirms the results of the Northern collection. R2 presents higher values compared to all readers. R1 and R3 are very similar and present higher values than R5 and R8 which are also very similar to each other. The average "horizontal diameters" for R1 and R3 are approximately 250 μm and approximately 180 - 200 μm for R8 and R5. The extreme mean values are presented by R2 at 400 μm.

From Figure 25 it can be seen that in the present collection the measurements of first ring diameters by R2 increase for older ages. Expert readers maintain consistent average diameter measurements for older ages and present similar values.

5.2.2 Second reading

The results obtained for the second reading are presented in Table 22. With regard to *L. budegassa*, an overall improvement was obtained in the second reading (Figure 26a, 27 and 28), however some discrepancies are still observed for older ages (Figure 26b). R3 and R4 are closer to the rest of the readers but still present some deviations (Table 23 and 24). The group of readers with good results in the first reading also achieve very good agreement between each other in the second reading. The values of the statistical indices decreased from the first reading to the second reading (Table 17).

6. DISCUSSION OF THE AGE READINGS

6.1. *Lophius budegassa*
From the first reading it can be seen that a group of 5 readers (R1, R5, R6, R7 and R8) seem to have similar age reading criteria. The exploratory analysis shows consistent age

reading amongst these readers and the statistical analysis indicates high agreement. The first ring determination is also consistent for this group of readers.

R2 seems to have similar ageing criteria to the group mentioned above, but for older ages, this reader shows certain discrepancies. This was observed from the results of the first reading, especially for the Southern collection, where this reader overestimated the age in older individuals. This reader increases the first ring diameter in older individuals and because of this, introduces a bias in the age reading.

In the first reading R3 and R4 used different ageing criteria to the other readers and thus underestimated all ages. The lack of previous experience in Anglerfish ageing and the low magnification used in the first reading were the most likely reasons for the observed discrepancies.

From the results of the second reading an overall improvement in ageing is observed. The group of readers R1, R5, R6, R7 and R8 maintain consistent age reading and R2 is closer to this group since the average age increment in older ages is not as significant. Since the first ring diameter was not measured in the second reading, the deviations in the first ring measurements in older ages shown by R2 in the first readings, could not be verified. In the second reading R3 and R4 are much closer to the rest of the readers. The higher magnification used by these readers in the second reading (x100) was considered to be the main reason for better results being obtained. It was concluded by the group that insufficient detail of the *illicium* section is shown under x50 magnification (that magnification used by R3 and R4 to carry out the first reading).

6.2. *Lophius piscatorius*

A group of readers (R1, R5 and R6) seem to have similar age reading criteria. For the first reading the exploratory analysis showed consistent age reading and the statistical analysis indicated high agreement between these readers.

From the data analysis of the first reading it can be seen that R2 and R7 seem to have similar ageing criteria to the group mentioned above although they tend to underestimate the older ages. The 1st "horizontal ring measurements" obtained by R2 seem to be consistently much higher than the rest of the readers.

The first reading shows that R8, whilst having similar ageing criteria to the main group mentioned above, tends to overestimate older ages.

R3 and R4 show different ageing criteria to the other readers. This is probably due to their lack of previous experience in Anglerfish age reading and the use of significantly lower magnification during first reading.

A general improvement was obtained from the second reading. The readers R1, R5 and R6 maintained high agreement.

The fish sizes in the sample of *L. piscatorius* were in general larger than those in the sample of *L. budegassa.* This may account for the higher variability in the older ages.

The 1st ring measurements ("horizontal" diameter) in *illicia* from *L. piscatorius* seem to be around 200 - 250 μm.

7. AGEING CRITERIA

Anglerfish ageing using *illicia* consists of counting translucent and opaque rings. At times these rings are well defined and clearly visible, but most of the time, rings appear doubled and are not well defined, which makes ring counting very difficult. From the open discussion and communal interpretation of *illicia* sections during the workshop, some peculiarities inherent to *illicia* ageing were defined (Annex 4 contains the images that are referred to in this section):

- The length of the fish can be a useful piece of information in ageing *illicia.*

- It may be useful to read the second fin ray to confirm the age attributed based on the *illicium* (Image 1).

- Confusion after age 6 may be related to first maturation which causes changes in the growth pattern.

- At times the outer ring(s) are not visible in the whole *illicium*, this may be because the section has not been cut perpendicularly (Image 2).

- The area of the *illicium* that is chosen for cutting has an influence on the size and shape of all rings (Image 3). A standardised cut position at about 5 mm from the *illicium* basis is recommended.

- Rings may not be visible in all the axes of the section.

- Defined rings, which are clearly visible in one part of a section may be less defined or even appear to double in another part of the section. The counting should be based upon the area where good contrast between rings exists.

- Bands in *illicia* differ in composition. As a result, the surface appears as alternative high and low areas. The difference in levels relates directly to dark and light bands. This characteristic is very apparent from research carried out using scanning electron microscopy (Annex 5).

- Unlike otoliths where band widths tend to decrease as you approach the edge, in *illicia* bands remain approximately the same width throughout the section or bands close to the border may even be larger than those closer to the nucleus (Image 4 and 5).

- Readers may find it helpful to alter the light and focus as they interpret the sections.

- Light diffraction may change the ring coloration, bright to dark or vice versa (Image 2 and 6) depending on the focus or the way the *illicium* was cut.

- The first well-marked ring is considered to be a consequence of a change in the life cycle (changing from planktonic to benthic living), and is therefore designated as the benthic ring. The next ring is considered to be the first annulus (Image 7 and 8).

- When identifying the first *annulus* the diameter of the benthic ring can be of assistance. The distance of the first *annulus* from the benthic ring is usually not greater than half the distance of the diameter of the benthic ring.

- For *L. budegassa* the horizontal or vertical distance of the first ring tends to be at 100 µm. The first ring is circular in shape (Image 7).

- In *L. piscatorius* the first ring tends to be oblong in shape thus the largest axis tends to be between 200 and 250 µm and the smallest axis tends to be between 80 and 160 µm (Image 8).

- Two distinct criteria for first ring identification of *L. piscatorius* were identified from the discussion and measurements. R1, R6 and R7 identified a larger ring and R5 and R8 a smaller ring, as the first annulus (Image 9). It was agreed by all readers that the larger ring should be considered to be the first annulus, thus the criterion of R1, R6 and R7 was adopted.

8. CONCLUSIONS

From the present ageing workshop a group of readers with good agreement, was identified for each species. The exploratory and statistical analyses showed that ageing was very consistent and first ring identification very similar, for these groups. The APE index had decreased substantially compared to previous workshops.

Prior to this workshop longevity had been assumed to be approximately 20 years for both species, however much older *L. piscatorius* were observed during this workshop.

Limiting ages, above which, agreement between readers diminished considerably, were established for both species. This age was 14 years for *L. budegassa* and 10 years for *L. piscatorius*. These limits could be considered as the confidence limits for ageing both species and could serve as the plus group for stock assessment.

9. RECOMMENDATIONS

- Produce a training guide to ageing *illicia*. This should include elements from the protocol of *illicia* age determination, age reading criteria and digitised images. These images will have been annotated by the more experienced *illicia* readers to illustrate the peculiarities of *illicia* ageing. This document will be a live document and will be open to updating as and when more research is carried out and advances are made on ageing criteria (Annex 6).
- It is recommended that the Working Group on the Assessment of Southern Shelf Demersal Stocks examines the + group for Anglerfish when constructing the age/length keys. At present it is 10^+ for both species, perhaps this could be raised.
- When the next exchange occurs, both *illicia* sections and their respective digitised images should be circulated. The position of the rings can be annotated on the images and these can be compared at the workshop.
- In future exchanges when asked to measure the first ring of each species, it is only necessary to measure the horizontal diameter of *L. budegassa* as this ring is circular in shape. Both the horizontal and vertical axes of *L. piscatorius* must be measured because of the oblong shape of the first ring.
- Validation of age reading is necessary and this should be carried out on more than one structure. Methods of tagging and chemical marking (Annex 7) should be used in addition to modal length distribution analysis.

- It is recommended that in future *illicia* exchanges, older fish (>50 cm   *L. budegassa* and >70 cm *L. piscatorius*) and younger fish (<20 cm for both species) should be included in the samples.
- Digitising and multimedia systems are recommended to aid communal readings and discussions.
- More readers should become involved in age determination of Anglerfish for stock assessment purposes.
- A regular *illicia* reading exchange is considered necessary for the purpose of checking the precision of all readers involved in age determination.
- In order to improve ageing agreement, it is recommended that workshops are held regularly amongst the countries involved in stock assessment. The collection of *Illicia* should include samples from all North Eastern Atlantic European Anglerfish Stocks.
- More studies based on life history events of Anglerfish are strongly recommended in order to identify the occurrences of some characteristic rings (Image 6 and 7), which are very prominent in the *illicium*.

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Table 1 - *Lophius budegassa* - Nothern Collection - 1st Reading. Total results obtained by reader.

				R1 - Iñaki Quincoces				R2 - Asier Zamakona				R3 - Helen McCormick					R4 - Fiona Woods					R5 - Jorge Landa						R8 - Rafael Duarte				
PLATE	Row//Num.	Length (mm)	Date (dd/mm/yy)	Age	Cred.	Vert.	Horiz.	Age	Cred.	Vert.	Horiz.	Age	Cred.	Vert.	Horiz.	Cont.	Age	Cred.	Vert.	Horiz.	Cont.	Age	Cred.	Edge	Vert.	Horiz.	Cont.	Age	Cred.	Vert.	Horiz.	Cont.
227	2a/2	416	23-01-1997	6	M	90	80	7	Med.	140	140	2	M		0.3		2	H		0.3		6	h	o	50	60		7	m/h	54	60	
227	2b/2	527	23-01-1997	9	H	80	80	9	High	160	160	5	M		0.26		5	H		0.28		10	h	h	20	30		10	m/h	78	83	
227	2b/3	452	23-01-1997	8	M	80	80	8	Med.	140	140	2	M		0.32		5	M		0.16		7/8	m	h			first ring	9	m/h	55	47	
227	2b/4	186	23-01-1997	3	B	-	-	3	Med.	90	90	1	M		0.16		1	H		0.16			u					3	b/m	54		
227	2b/5	190	23-01-1997	3	B	-	-	3	Bad	60	70	1	M		0.14		1	H		0.14		2	b	h			first ring	3	b/m			
227	2b/6	570	23-01-1997	10	M	110	80	10	Med.	200	190	3	M		0.4		3	H		0.36		8	m	o	60	60		12	m	61	79	
244	2a/3	805	13-02-1997	15	M	80	85	16	Med.	225	235	7	M		0.38		7	H		0.38		13/12/14	h	o	60	70		17,18	m	73	67	
244	2b/1	584	13-02-1997	10	M	-	-	10	Med.	225	235	4	B		0.24		4	H		0.28		10	h	h	110	140		12	m	74	54	
244	2b/2	829	13-02-1997	17	M	100	90	17	Med.	230	240	8	M		0.38		9	B		0.36		18/19/17	m	h	40	60		19	m	66	78	
244	2b/3	789	13-02-1997	-	-	-	-	15	Med.	280	290	4	B			Air bubble	5	H		0.38	Air Bubble	12	m	h	50	50		18,19	b			
247	5b/3	374	13-02-1997	7	M	80	90	6	Med.	140	145	1	H		0.4		1	H		0.4			u		30	40		8	m	50	54	
252	3a/2	320	20-02-1997	6	M	80	80	6	Med.	115	120	3	M		0.2		3	H		0.22		6	m	h	40	50		7	m	46	50	
252	3a/4	326	20-02-1997	6	B	70	70	6	Med.	130	135	2	B		0.26		2	H		0.24		6/5	m	h	40	40		7	m	55	66	
252	3b/1	262	20-02-1997	5	B	90	90	5	Med.	100	100	1	H		0.26		1	H		0.26		5/4	b	h	30	50		4	m	74	59	
258	4a/3	664	20-02-1997	11	M	60	70	11	Med.	410	410	5	B		0.2		6	H		0.48		13/12	m	h	50	50		14	m/h	99	99	
262	3b/3	363	03-03-1997	6	B	-	-	7	Med.	110	100	1	H		0.26		3	B		0.18		5	b	h	50	50		5,7	b	45	52	
264	5a/1	225	05-03-1997	-	-	80	90	4	Med.	90	100	1	H		0.2		1	H		0.2		3	b	o	55	55		3	b			
264	5b/1	756	05-03-1997	13	M	120	110	15	Med.	335	340	7 or 8	B		0.24		10	M		0.34		15	m	h	70	90		17	m	57	66	
264	5b/4	375	05-03-1997	7	M	70	60	7	Med.	110	125	2	M		0.3		3	M		0.14		6	h	h	40	50	ery good	6	m	60	60	
264	5b/5	571	05-03-1997	10	M	70	70	10	Med.	175	180	2	B		0.28		4	M		0.28		9	m	h	40	50		8,9	m	64	75	
276	2a/4	533	20-03-1997	9	M	90	120	9	Med.	155	170	2	B		0.26		2	M		0.26		8	m	h	50	60		8	b/m	62	58	
276	2b/2	479	21-03-1997	8	M	90	80	8	Med.	130	135	4	B		0.3		5	H		0.16		8	m	o	30	30		7	b	64	71	
276	2b/4	744	21-03-1997	13	M	70	90	14	Med.	235	235	5	M		0.18		8	M		0.26		13	h	h	50	70	good	14	b/m	84	75	
277	3a/5	456	22-03-1997	8	M	80	80	7	Med.	110	110	3	M		0.3		4	M		0.18	Black mark	8	h	h	40	50	good	10	m	47	58	
277	3b/3	706	22-03-1997	12	M	110	100	12	Med.	170	170	4	B		0.3		5	B		0.32		12	h	o	50	60	good	14	m/h	67	71	
277	3b/4	731	22-03-1997	13	M	70	90	13	Med.	190	200	4	M		0.2		4	H		0.46		13/12	h	h			first ring	14	m/h	73	73	
313	4a/4	626	14-04-1997	11	M	80	90	11	Med.	190	200	3	M		0.4		4	M		0.38		10	h	h	50	70		11	m	72	75	
313	4a/5	679	14-04-1997	12	B	90	90	12	Bad	215	220	5	B		0.24		5	M		0.32		11/12	m	h	60	70		13	m	74	75	
313	4a/6	752	14-04-1997	-	-	130	130	14	Med.	260	275	3	B		0.24		4	H		0.24			u		60	60		u				
313	4b/4	713	14-04-1997	12	M	90	100	13	Med.	195	200	5	H		0.34		4	H		0.34		13/12	m	o	30	40		13	m	82	91	
324	5a/1	190	20-05-1997	3	M	-	-	3	Med.	110	110	1	H		0.2		1	H		0.22		2	b		30	40		2	m			
324	5a/2	193	20-05-1997	-	-	-	-	3	Med.	235	210	1	H		0.26		1	H		0.24			u					2	b			
324	5a/3	191	20-05-1997	3	B	-	-	3	Med.			1	H		0.2		1	H		0.2			u					2	b			
324	5b/7	232	20-05-1997	2	M	iscatorius		4	Med.	220	120	2	M		0.2		2	H	0.18	0.26												PIS
324	5b/8	291	20-05-1997	3	M	iscatorius		5	Med.	260	120	2	B		0.36		3	M	0.16	0.24												PIS

Table 1 - *Lophius budegassa* - Nothern Collection - 1st Reading. Total results obtained by reader (Cont.).

2nd SEM.(2nd HALF YEAR)				Iñaki Quincoces				Asier Zamakona				Helen McCormick					Fiona Woods					Jorge Landa						Rafael Duarte				
PLATE	Row/Num.	Length (mm)	Date (dd/mm/yy)	Age	Cred.	Vert.	Horiz.	Age	Cred.	Vert.	Horiz.	Age	Cred.	Vert.	Horiz.	Cont.	Age	Cred.	Vert.	Horiz.	Cont.	Age	Cred.	Edge	Vert.	Horiz.	Cont.	Age	Cred.	Vert.	Horiz.	Cont.
360	2b/8	465	13-10-1997	7	m	80	80	8	Med.	150	150	2	M		0.24		3	B		0.16		7	m	o	40	40		8	h	70	75	
362	4a/4	245	03-11-1997	4	m	60	70	4	Med.	105	105	2	M		0.2		2	B		0.14		4/5	m	o	30	40		5	m	62	65	
363	5a/1	275	03-11-1997	4	h	70	80	4	High	120	120	1	M		0.18		2	B		0.16		4	h	o	40	50		5	m	53	56	
363	5a/4	285	03-11-1997	4	m	60	55	5	Med.	100	100	1	H		0.18		1	H		0.18		4	b	o	40	50		5	m	49	49	
363	5b/3	305	03-11-1997	4	b	75	60	5	Med.	130	140	1	M		0.2		3	H		0.12		5	m	o	30	50		5	m	55	54	
364	1b/3	345	03-11-1997	5	m	80	95	6	Med.	130	140	1	B		0.24		2	H		0.18			u		20	40		5	b/m	54	66	
365	2b/2	395	03-11-1997	6	m	80	70	7	Med.	105	105	1	M		0.24		2	B				6	m	o	30	40		7,8	b/m	53	58	
365	2b/5	405	03-11-1997	6	h	70	80	7	High	115	115	3	M		0.26		3	M				7/6	m	o	30	40		6	m/h	66	71	
365	2b/8	405	03-11-1997	7	h	85	80	7	Med.	135	135	3	M		0.18		4	B				7	h	o	40	40		9	h	68	71	
366	3a/6	435	03-11-1997	7	m	60	70	8	Med.	190	190	2	B		0.24		2	B				7	m	o	55	70		7	m/h	58	66	
366	3a/9	505	03-11-1997	8	m	90	65	9	Med.	110	130	3	M		0.22		1	H				7	m	o	40	50		8,9	m/h	76	66	
366	3b/3	535	03-11-1997	8	m	-	-	10	Med.			4	M		0.3		4	H				8	h	o	50	60		10	h	68	62	
366	3b/5	545	03-11-1997	9	m	60	70	9	Med.	180	190	4	B		0.2		5	B				9	b	o	40	50		10	m	61	66	
367	4a/9	565	03-11-1997	-	-	75	80	11	Med.	170	190	6	B		0.38		3	B				10/9	b	o	20	40		9	b/m	72	83	
367	4b/5	585	03-11-1997	10	m	85	90	11	Med.	185	195	4	B		0.38		4	B				10	m	o	30	40		11	m/h	81	73	
367	4b/9	595	03-11-1997	9	m	70	60	12	Med.	285	290	8	M		0.18		5	M				11	m	o	25	35		11	m/h	66	77	
368	5a/6	635	03-11-1997	10	m	60	70	13	Med.	140	150	6	B		0.18		5	M				9	m	o	50	60		10,12	m/h	70	57	
369	1a/1	245	10-11-1997	4	m	-	-	4	Med.	120	125	1	H		0.16		1	H				4	h	o	40	50		5	b/m	42	50	
369	1b/2	355	10-11-1997	5	m	70	80	7	Med.	135	135	2	M		0.18		4	H				5	m	o	40	50		7	m	55	54	
369	1b/5	385	10-11-1997	6	m	80	80	7	Med.	115	120	2	M		0.2		4	B				6/5/7	b	o	30	40		8	m	58	65	
371	3a/1	655	10-11-1997	10	h	70	65	13	High	205	205	5	M		0.32		6	H				10	m	o	60	70		12	m	68	60	
371	3a/4	745	10-11-1997	12	m	90	100	15	Med.	180	190	5	M		0.34		6	B				11	h	o	70	80		13	m/h	77	66	
371	3b/1	750	17-11-1997	13	m	90	95	15	Med.	265	270	3	B		0.38		6	H				13	m	o	50	60		13,14	m	56	63	
374	1b/2	185	24-11-1997	3	m	70	80	3	High	75	75	0	H		0.14		0	H				2	b	o			first ring	2	m			
374	1b/4	235	24-11-1997	4	m	80	80	5	Med.	80	85	0	H		0.24		3	H				2	m	o	80	80		3	m	80	81	
374	1b/5	355	24-11-1997	5	m	85	90	6	Med.	110	115	1	B				5	H				5	m	o	60	70		6	m	60	64	
374	1b/7	415	24-11-1997	6	m	90	60	7	Med.	215	220	1	B		0.3		4	H				6	m	o	40	50		8	m	49	56	
375	2a/2	475	24-11-1997	7	m	85	90	9	Med.	160	165	2	M		0.32		5	H				6	h	o	40	50		7	m	65	63	
375	2a/3	475	24-11-1997	7	h	100	90	9	High	150	160	3	M		0.24		6	H				7	m	o	40	50		9,10	m	61	51	
375	2b/2	705	24-11-1997	12	m	80	70	14	Med.	160	160	4	M		0.26		6	M				12/11	m	o	30	40		11,12	m	65	75	
375	2b/6	775	27-11-1997	14	m	100	90	17	Med.	210	210	6	M		0.28		6	H				13	m	o	30	40		15	m	76	85	
376	3a/4	238	01-12-1997	3	b	80	80	4	Med.	80	85	0	H		0.24		1	B				4	m	o	20	40		3	b			
376	3b/6	252	01-12-1997	4	m	60	70	4	Med.	115	120	0	H		0.28		1	H				4	m	o	30	40		3	b/m	69	62	
376	3b/8	253	01-12-1997	4	b	-	-	4	Bad	125	120	0	H		0.24		1	M				4	b	o			first ring	3	m	81	80	
378	5b/6	150	22-12-1997	2	b	-	-	2	Med.	135	140	0	H		0.2		0	H					u					1	b			

Table 2 - *Lophius budegassa* - Southern Collection - 1st Reading. Total results obtained by reader

Placa	Ordem	Illicium / 2nd ray	Lt. (cm)	Date	R1 - Iñaki Quincoces					R2 - Asier Zamakona						R5 - Jorge Landa				R6 - Hervé Dupouy			R7 - Bernard Kergoat			R8 - Rafael Duarte			
					Age	Cred.	Diam.(ym)	Border	Ampl. X	Age	Cred.	am.(ym)		Border	Ampl.X	Age	Cred.	Diam.(ym)	Corte	Age	Cred.	Diam.(ym)	Age	Cred.	Diam.(ym)	Age	Cred.	Diam.(ym)	Corte
1	5	Illicium	36.0	nov.96	6	Medium	85			6	Med.	180	190	O	40	6		50		8	b	50	8	b	60	6		76	11
1	8 a	Illicium	37.8	oct.96	6	High	70			7	High	145	155		40	7;8	m	35		7	m	70	8	b	60	6		66	11
1	8 b	2nd ray	37.8	oct.96	6	Medium	-			7	Med.					7	h	130		7	m	140	8	b	140	6		80	11
1	9	Illicium	38.0	oct.96	6	High	85			7	Med.	120	105		40	6	h	50		8	b	100	8	b	90	6		66	11
1	14	Illicium	39.0	nov.96	6	High	90			7		135	135	O	100	6;7	m	50		9	m	?	8	b	100	6;7		71	7
1	15	Illicium	40.0	oct.96	6	High	85			7	High	150	150	O	40	7;8	m	45		8	m	60	9	b	80	7		65	7
2	1 a	Illicium	49.0	feb.97	9	Bad	75			9	Med.	150	155	H	100	7	m	60		9	b	80	9	b	80	7;8	m/h	71	15
2	1 b	2nd ray	49.0	feb.97	-	-	-			9	High			H		7	m	230		10	b	140	10	b	160	7	m/h	103	15
2	10	Illicium	50.0	mar.97	9	Medium	90			9	Med.	155	195	H	40	8	b	75		10	b	100	10	b	120	7	m	68	15
3	2	Illicium	51.0	sep.96	9	High	80			9	High	110	120	O	100	6	h	50		11	m	80	10	b	70	9	m	68	14
3	7	Illicium	53.0	sep.96	9	Medium	70			10	High	95	95	H	100		b			10	h	90	10	b	80	8;9	b/m	63	10
3	10	Illicium	54.0	sep.96	9	Medium	90			10	Med.	115	130	H	100	8	h	40		10	m	70	10	b	80	8;9	m	82	14
3	14	Illicium	55.0	aug.96	9	Medium	100-70??			10	Med.	150	160	O	100	8	h	45		11	m	80	11	m	100	11	m	76	14
3	17	Illicium	56.0	sep.96	9	Medium	90			11	Med.	130	135	O	100	8	m	40		8	m	90	9	b	100	10;11	m	55	14
4	5	Illicium	65.0	jul.97	11	Bad	75			13	High	260	280	O	100	10	m	60		13	m	100	13	m	110	11;12	m/h	82	11
4	7	Illicium	66.0	jul.97	11	High	100			13	High	160	160	O	100	12	h	45		12	m	80	12	m	90	12;13	m/h	72	11
4	11 a	Illicium	67.0	sep.97	11	Medium	100			14	High	110	110	H	40	11	h	50		12	b	100	12	b	110	12;13	m/h	64	11
4	11 b	2nd ray	67.0	sep.97	10	Bad	-			14	Med.			H		10	h	190		13	b	160	12	b	170	13	m	121	11
4	14	Illicium	68.0	jul.97	12	Medium	80			14	Bad	200	198	H	100	11	m	65		14	b	100	13	b	100	11	m	72	11
5	2	Ilicium	58.0	oct.96	9	Medium	90			11	High	135	145	H	40	9	h	50		11	b	80	10	b	100	6;7	m	67	11
5	10	Ilicium	59.0	dec.96	9	Medium	-			11	Med.	155	155	H	100	9	m	50		11	b	120	11	b	120	8	m	87	11
6	1	Ilicium	21.0	jul.97	3	Bad	-			4 ó 3	Med.	110	115		100	4	m	40		3	m	100	2	b	100	3	m	64	4
6	2a	Ilicium	22.0	jul.97	3	Bad	-			4	Med.	100	105	H	100		b			4	b	100	3	b	80	3	m	55	5
6	2b	2nd ray	22.0	jul.97	4	Bad	-			4	Med.			H		4	m	110		4	b	160	4	m	110	4	m	132	4
6	3	Ilicium	23.0	jul.97	4	Bad	-			4	Med.	120	120		100		b			4	m	100	4	m	100	4	m	89	4
6	6	Ilicium	24.0	jul.97	4	Bad	60			4	Med.	160	170	H	100	4	m	50								3;4	m	68	4
7	2	Ilicium	83.0	apr.97	15	Medium	90			17	Med.	190	190		40	13	m	60		13	b	120	14	b	140	13;14	m	81	14
7	4	Ilicium	84.0	mai.97	15	Bad	125			18 ó 19	High	270	275		40	16	h	50		15	m	140	16	b	140	17;19	m	78	14
7	6	Ilicium	85.0	mai.97	14	Medium	150			20	Med.	150	150		40	13	h	50		11	b	120	12	b	90	13;15	m	88	14
7	7	Ilicium	87.0	apr.97	15	Bad	135			20	Med.	235	240		40	15	h	50		17	m	140	14	b	140	15	m	70	14
7	9	Ilicium	88.0	apr.97	16	Medium	150			20		225	225		40	14	h	50		18	h	130	16	b	140	15	b/m	69	14
8	6	Ilicium	76.0	mai.97	13	Bad	140			17	Med.	220	220		40		u			14	b	140	14	m	140	14	m/h	66	14
8	7	Ilicium	77.0	apr.97	12	Bad	135			16	Bad	275	280		40	12	b	50		13	b	140	15	b	120	13;14	b	76	19

Table 2 - *Lophius budegassa* - Southern Collection - 1st Reading. Total results obtained by reader (Cont.).

Placa	Ordem	Illicium / 2nd ray	Lt. (cm)	Date	R1 - Iñaki Quincoces Age	Cred.	Diam.(ym)	Border	Ampl. X	R2 - Asier Zamakona Age	Cred.	am.(ym)		Border	Ampl.X	R5 - Jorge Landa Age	Cred.	Diam.(ym)	Corte	R6 - Hervé Dupouy Age	Cred.	Diam.(ym)	R7 - Bernard Kergoat Age	Cred.	Diam.(ym)	R8 - Rafael Duarte Age	Cred.	Diam.(ym)	Corte
9	1	Ilicium	60.0	jul.97	10	Medium	130			12	Med.	183	183		100	10	m	40		10	b	100	11	b	100	10;11	b	59	11
9	2	Ilicium	61.0	jul.97	11	Medium	115			12 ó 13	High	137	137		100	11	m	80		12	b	100	11	b	100	10;11	m	77	11
9	8	Ilicium	62.0	jul.97	10	Bad	70			12 ó 13	Med.	170	170		40	11	m	50		12	b	90	12	b	100	12;13	m	68	11
9	13	Ilicium	63.0	aug.97	10	Medium	65			11	High	190	195		40	11	m	55		13	h	120	12	b	120	12	m	62	11
9	16	Ilicium	64.0	jul.97	11	Medium	75			12	High	170	175		40	12	m	60		12	b	100	12	b	110	11;13	b/m	71	11
10	1	Ilicium	32.0	oct.96	5	High	70			5	High	145	150		40	4	m	30		5	b	?	5	b	110	5	m/h	61	6
10	5	Ilicium	33.0	oct.96	5	Medium	60			5	Med.	75	65		100	5	m	35		4	b	60	4	b	100	5	m/h	55	6
10	9	Ilicium	34.0	dec.96	5	Bad	85			6	High	125	120		40	6	h	65		6	m	70	6	b	100	5;6	m	56	6
10	10	Ilicium	35.0	nov.96	5	Medium	85			6	Med.	125	125		100	5	h	45		6	m	70	6	b	120	6		66	6
11	11	Ilicium	56.0	dec.96	9	Medium	100			11	Med.	160	170		40	9	h	50		12	m	100	10	b	110	11;12	m/h	58	15
11	14	Ilicium	57.0	oct.96	9	Medium	105			11	Med.	105	110		100	9	h	55		11	b	90	10	b	120	9;11	b/m	59	15
12	1	Ilicium	73.0	jun.97	12	Medium	95			15	Bad	200	215		40	11	m	35		13	b	100	11	b	100	12	b/m	86	19
12	5	Ilicium	74.0	apr.97	13	Medium	80			16	Med.	175	180		40	11	b	35		14	b	80	12	b	120	13;14	m	74	19
12	8	Ilicium	75.0	apr.97	13	Medium	105			16	Med.	225	225		40	12	m	55		13	b	100	11	b	100	14	m/h	87	17
13	6	Ilicium	71.0	mai.97	12	Medium	80			16	High	150	150		40	12	m	55		14	m	100	12	b	110	15	b/m	61	21
13	10	Ilicium	72.0	jun.97	12	Medium	80			16	High	120	125		100	12	m	25		14	h	110	12	b	100	11;12	b/m	61	21
13	11	Ilicium	73.0	mai.97	13	Medium	75			17	High	210	210		100	11	m	35		12	b	90	13	b	110	13;14	b/m	69	23
14	1	Ilicium	40.0	oct.96	6	Medium	65			8	High	135	135		100	5;6	b	30		6	b	80	7	b	70	6	b/m	54	7
14	3	Ilicium	41.0	otc.96	6	Bad	95			7	Bad	150	155		100	6	h	60		7	m	80	8	b	80	7	m	49	12
14	8a	Ilicium	42.2	oct.96	7	Bad	70			7 ó 8	Med.	120	120		100	6	m	50		?		?	8	b	80	7;8	b/m	66	12
14	8b	2nd ray	42.2	oct.96	6	Bad	-			7	Med.					7	m	150		7	b	150	8	b	150	8;9	b/m	101	7
14	10	Ilicium	43.0	oct.96	7	Bad	75			7	Med.	135	145		100	6	m	45		8	b	80	10	b	100	8	b/m	67	12
15	2a	Ilicium	25.5	jun.97	4	Medium	95			4	High	180	190		100	3;4	h	50		5	m	110	5	b	100	4	m	48	8
15	2b	2nd ray	25.5	jun.97	-	-	-			4	Unr.					3	h			5	b	140	5	b	140	5	b/m	98	8
15	7a	Ilicium	26.0	jun.97	4	Medium	90			4	High	160	160		100	4	m	40		5	b	70	5	b	80	4	b/m	66	5
15	7b	2nd ray	26.0	jun.97	5	Medium	-			4	Med.						u			?		160	5	b	140	6	b/m	105	5
15	11a	Ilicium	27.0	jun.97	4	Bad	70			4	High	145	150		100	4	h	40		4	b	80	6	b	110	4;5	b/m	71	5
15	11b	2nd ray	27.0	jun.97	5	Bad	-			4	High					4	h	270		4	h	140	6	b	150	4	b/m	107	5
16	2a	Ilicium	44.0	oct.96	7	Bad	70			8	Med.	105	110		100	6	b	40		6	b	70	8	b	90	6;7	b	71	9
16	2b	2nd ray	44.0	oct.96	-	-	-			8	Med.					6	b	280		6	b	200	8	b	160	7	b	123	9
16	7	Ilicium	45.7	dec.96	7	Bad	75			8	High	160	155		100	7	m	50		7	b	80	8	b	80	7	b/m	46	9
16	8a	Ilicium	46.2	oct.96	7	Bad	95			8	High	170	170		100	9	m	45		7	b	80	9	b	100	8;9	m	88	9
16	8b	2nd ray	46.2	oct.96	8	Bad	-			8	High					9	h	180		8	m	160	9	b	160	9;10	b/m	129	9

Table 2 - *Lophius budegassa* - Southern Collection - 1st Reading. Total results obtained by reader (Cont.).

Placa	Ordem	Illicium / 2nd ray	Lt. (cm)	Date	R1 - Iñaki Quincoces					R2 - Asier Zamakona						R5 - Jorge Landa				R6 - Hervé Dupouy			R7 - Bernard Kergoat			R8 - Rafael Duarte			Corte
					Age	Cred.	Diam.(μm)	Border	Ampl. X	Age	Cred.	am.(μm)		Border	Ampl.X	Age	Cred.	Diam.(μm)	Corte	Age	Cred.	Diam.(μm)	Age	Cred.	Diam.(μm)	Age	Cred.	Diam.(μm)	
17	10	Ilicium	69.0	mai.97	10	Bad	95			14	Med.	220	220		100	10	m	40		10	b	100	11	b	100	11	m	85	10
17	12	Ilicium	70.0	jun.97	11	Bad	90			15	Med.	210	215		100	10	m	50		11	b	100	12	b	100	10	m	79	10
18	1a	Ilicium	47.0	feb.97	8	Bad	80			8	Med.	135	135		100	7	m	35		10	b	70	7	b	110	7	m/h	65	9
18	1b	2nd ray	47.0	feb.97	7	Bad	-			9	Med.					8	m	50		10	b	160	8	b	160	7	m	159	9
18	7a	Ilicium	48.0	feb.97	8	High	100??			9	High	165	165		100	9	h	40		9	b	100	9	b	100	8	m/h	103	9
18	7b	2nd ray	48.0	feb.97	9	Bad	-			9	Med.					9	h	250		8	m	240	10	b	160	8	m	182	9
19	1a	Ilicium	79.0	apr.97	13	Medium	80			18	Med.	225	225		40	13	m	40		15	b	100	13	b	100	15	m	80	15
19	1b	2nd ray	79.0	apr.97	-	-	-			17	Med.						u			?		?	14	b	200		u		15
19	4	Ilicium	80.0	apr.97	14	Medium	85			20	High	165	165		40	12	h	35		13	m	100	14	b	120	12	m/h	74	15
19	6	Ilicium	81.0	apr.97	15	Bad	95			19 ó 18	Med.	160	165		40	15	h	35		15	m	110	15	b	100	15	m/h	81	15
19	8	Ilicium	82.0	jun.97	15	Bad	100			18	Med.	200	200		40	12	b	35		16	b	120	16	b	100	15;16	m	103	15
20	1	Ilicium	28.0	oct.96	4	High	75			5	Med.	135	130		100	5	m	35		5	b	90	7	b	80	5	m	65	4
20	3	Ilicium	29.0	oct.96	4	High	85			5	Med.	135	130		100	5	m	45		6	b	100	7	b	90	5	m	62	4
20	6	Ilicium	30.0	oct.96	4	High	80			5	Med.	160	150		100	4;5	m	55		6	m	100	6	b	80	5;6	m	52	8
20	8	Ilicium	31.0	oct.96	4	High	90?			5	Med.	135	145		100	5	h	45		5	b	80	7	b	80	6	m	57	4

Table 3 - *L. budegassa* - Northern Collection - 1st Reading. Age attributed by reader and difference to the modal age.

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	R1 age-mode	R2 Age	R2 age-mode	R3 Age	R3 age-mode	R4 Age	R4 age-mode	R5 Age	R5 age-mode	R8 Age	R8 age-mode
374	1b/2	374-1b/2	185	24-Nov	2	3	2	3	1	3	1	0	-2	0	-2	2	0	2	0
227	2b/4	227-2b/4	186	23-Jan	2	3	3	3	0	3	0	1	-2	1	-2			3	0
324	5a/1	324-5a/1	190	20-Mai	2	3	2	3	1	3	1	1	-1	1	-1	2	0	2	0
227	2b/5	227-2b/5	190	23-Jan	2	3	3	3	0	3	0	1	-2	1	-2	2	-1	3	0
264	5a/1	264-5a/1	225	5-Mar	2	3	3			4	1	1	-2	1	-2	3	0	3	0
374	1b/4	374-1b/4	235	24-Nov	3	4	-	4		5		0		3		2		3	
376	3a/4	376-3a/4	238	1-Dez	3	4	3	3	0	4	1	0	-3	1	-2	4	1	3	0
362	4a/4	362-4a/4	245	3-Nov	4	4	4	4	0	4	0	2	-2	2	-2	4	0	5	1
369	1a/1	369-1a/1	245	10-Nov	3	4	4	4	0	4	0	1	-3	1	-3	4	0	5	1
376	3b/6	376-3b/6	252	1-Dez	3	4	4	4	0	4	0	0	-4	1	-3	4	0	3	-1
376	3b/8	376-3b/8	253	1-Dez	3	4	4	4	0	4	0	0	-4	1	-3	4	0	3	-1
252	3b/1	252-3b/1	262	20-Fev	4	5	5	5	0	5	0	1	-4	1	-4	5	0	4	-1
363	5a/1	363-5a/1	275	3-Nov	3	4	4	4	0	4	0	1	-3	2	-2	4	0	5	1
363	5a/4	363-5a/4	285	3-Nov	3	5	4	4	0	5	1	1	-3	1	-3	4	0	5	1
363	5b/3	363-5b/3	305	3-Nov	4	5	5	4	-1	5	0	1	-4	3	-2	5	0	5	0
252	3a/2	252-3a/2	320	20-Fev	5	6	6	6	0	6	0	3	-3	3	-3	6	0	7	1
252	3a/4	252-3a/4	326	20-Fev	5	6	6	6	0	6	0	2	-4	2	-4	6	0	7	1
364	1b/3	364-1b/3	345	3-Nov	4	5	5	5	0	6	1	1	-4	2	-3			5	0
369	1b/2	369-1b/2	355	10-Nov	5	6	5	5	0	7	2	2	-3	4	-1	5	0	7	2
374	1b/5	374-1b/5	355	24-Nov	5	6	5	5	0	6	1	1	-4	5	0	5	0	6	1
247	5b/3	247-5b/3	374	13-Fev	5	7	-	7		6		1		1		-		8	
264	5b/4	264-5b/4	375	5-Mar	5	7	6	7	1	7	1	2	-4	3	-3	6	0	6	0
369	1b/5	369-1b/5	385	10-Nov	6	7	6	6	0	7	1	2	-4	4	-2	6	0	8	2
365	2b/2	365-2b/2	395	3-Nov	5	7	6	6	0	7	1	1	-5	2	-4	6	0	7	1
365	2b/5	365-2b/5	405	3-Nov	5	7	6	6	0	7	1	3	-3	3	-3	7	1	6	0
365	2b/8	365-2b/8	405	3-Nov	6	8	7	7	0	7	0	3	-4	4	-3	7	0	9	2
374	1b/7	374-1b/7	415	24-Nov	5	7	6	6	0	7	1	1	-5	4	-2	6	0	8	2
227	2a/2	227-2a/2	416	23-Jan	5	7	6	6	0	7	1	2	-4	2	-4	6	0	7	1
366	3a/6	366-3a/6	435	3-Nov	6	7	7	7	0	8	1	2	-5	2	-5	7	0	7	0
227	2b/3	227-2b/3	452	23-Jan	7	8	-	8		8		2		5		7		9	
277	3a/5	277-3a/5	456	22-Mar	7	8	8	8	0	7	-1	3	-5	4	-4	8	0	10	2
360	2b/8	360-2b/8	465	13-Out	6	8	7	7	0	8	1	2	-5	3	-4	7	0	8	1
375	2a/2	375-2a/2	475	24-Nov	6	7	7	7	0	9	2	2	-5	5	-2	6	-1	7	0
375	2a/3	375-2a/3	475	24-Nov	7	8	7	7	0	9	2	3	-4	6	-1	7	0	9	2
276	2b/2	276-2b/2	479	21-Mar	7	8	8	8	0	8	0	4	-4	5	-3	8	0	7	-1
366	3a/9	366-3a/9	505	3-Nov	6	8	8	8	0	9	1	3	-5	1	-7	7	-1	8	0
227	2b/2	227-2b/2	527	23-Jan	8	10	10	9	-1	9	-1	5	-5	5	-5	10	0	10	0
276	2a/4	276-2a/4	533	20-Mar	6	9	8	9	1	9	1	2	-6	2	-6	8	0	8	0
366	3b/3	366-3b/3	535	3-Nov	7	9	8	8	0	10	2	4	-4	4	-4	8	0	10	2
366	3b/5	366-3b/5	545	3-Nov	8	9	9	9	0	9	0	4	-5	5	-4	9	0	10	1
227	2b/6	227-2b/6	570	23-Jan	8	10	-	10		10		3		3		8		12	
264	5b/5	264-5b/5	571	5-Mar	7	9	-	10		10		2		4		9		8	
244	2b/1	244-2b/1	584	13-Fev	8	11	10	10	0	10	0	4	-6	4	-6	10	0	12	2
367	4b/5	367-4b/5	585	3-Nov	8	11	10	10	0	11	1	4	-6	4	-6	10	0	11	1
367	4b/9	367-4b/9	595	3-Nov	9	11	11	9	-2	12	1	8	-3	5	-6	11	0	11	0
313	4a/4	313-4a/4	626	14-Abr	8	11	11	11	0	11	0	3	-8	4	-7	10	-1	11	0
368	5a/6	368-5a/6	635	3-Nov	9	11	10	10	0	13	3	6	-4	5	-5	9	-1	10	0
371	3a/1	371-3a/1	655	10-Nov	9	11	10	10	0	13	3	5	-5	6	-4	10	0	12	2
258	4a/3	258-4a/3	664	20-Fev	10	12	-	11		11		5		6		13		14	

Table 3 - *L. budegassa* - Northern Collection - 1st Reading. Age attributed by reader and difference to the modal age (Cont.).

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	age-mode	R2 Age	age-mode	R3 Age	age-mode	R4 Age	age-mode	R5 Age	age-mode	R8 Age	age-mode
313	4a/5	313-4a/5	679	14-Abr	10	12	-	12		12		5		5		11		13	
375	2b/2	375-2b/2	705	24-Nov	10	12	12	12	0	14	2	4	-8	6	-6	12	0	11	-1
277	3b/3	277-3b/3	706	22-Mar	10	13	12	12	0	12	0	4	-8	5	-7	12	0	14	2
313	4b/4	313-4b/4	713	14-Abr	10	13	13	12	-1	13	0	5	-8	4	-9	13	0	13	0
277	3b/4	277-3b/4	731	22-Mar	10	13	13	13	0	13	0	4	-9	4	-9	13	0	14	1
276	2b/4	276-2b/4	744	21-Mar	11	14	13	13	0	14	1	5	-8	8	-5	13	0	14	1
371	3a/4	371-3a/4	745	10-Nov	10	13	-	12		15		5		6		11		13	
371	3b/1	371-3b/1	750	17-Nov	11	14	13	13	0	15	2	3	-10	6	-7	13	0	13	0
264	5b/1	264-5b/1	756	5-Mar	13	15	-	13		15		7		10		15		17	
375	2b/6	375-2b/6	775	27-Nov	12	15	-	14		17		6		6		13		15	
244	2a/3	244-2a/3	805	13-Fev	13	15	-	15		16		7		7		13		17	
244	2b/2	244-2b/2	829	13-Fev	15	18	-	17		17		8		9		18		19	

Table 4 – *L. budegassa* - Northern collection - 1st reading.
By modal age are presented the average age recorded, 2*stdev and number of age readings by reader and of all readers.

READER 1

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	3.00	2.25	4.00	4.80	6.13	7.00	8.20	9.00	9.80	10.00	12.00	12.75	-	-	-	-	-	-
2*stdev	-	-	0.00	3.00	0.00	0.89	0.71	0.00	0.89	-	0.89	2.83	0.00	1.00	-	-	-	-	-	-
n	0	0	2	4	6	5	8	5	5	1	5	2	2	4	0	0	0	0	0	0

READER 2

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	3.00	3.50	4.17	5.80	6.75	8.20	8.60	9.00	11.20	11.50	13.00	13.75	-	-	-	-	-	-
2*stdev	-	-	0.00	1.15	0.82	1.67	0.93	1.67	2.28	-	3.58	1.41	2.83	1.91	-	-	-	-	-	-
n	0	0	2	4	6	5	8	5	5	1	5	2	2	4	0	0	0	0	0	0

READER 3

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	0.50	0.75	0.83	1.20	2.00	2.40	3.20	4.00	4.80	5.50	4.00	4.25	-	-	-	-	-	-
2*stdev	-	-	1.41	1.00	1.51	0.89	1.51	1.10	1.67	-	1.67	7.07	0.00	1.91	-	-	-	-	-	-
n	0	0	2	4	6	5	8	5	5	1	5	2	2	4	0	0	0	0	0	0

READER 4

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	1.00	1.00	1.40	2.50	2.50	4.00	3.20	5.00	4.50	4.00	5.50	-	-	-	-	5.33	-	-
2*stdev	-	-	-	0.00	1.10	1.41	1.15	3.16	3.29	-	1.41	-	1.41	-	-	-	-	4.62	-	-
n	0	0	1	4	5	2	4	5	5	1	2	1	2	0	0	0	0	3	0	0

READER 5

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	2.00	2.25	4.00	4.00	6.13	6.80	7.80	9.00	9.80	10.50	12.00	13.00	-	-	-	-	-	-
2*stdev	-	-	0.00	3.42	0.00	4.47	0.71	0.89	0.89	-	0.89	1.41	0.00	0.00	-	-	-	-	-	-
n	0	0	2	4	6	5	8	5	5	1	5	2	2	4	0	0	0	0	0	0

READER 8

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	2.00	3.00	4.33	5.40	7.00	8.00	8.60	10.00	11.00	11.00	12.50	13.50	-	-	-	-	-	-
2*stdev	-	-	0.00	0.00	2.07	2.28	1.51	2.00	2.68	-	2.00	0.00	4.24	1.15	-	-	-	-	-	-
n	0	0	2	4	6	5	8	5	5	1	5	2	2	4	0	0	0	0	0	0

ALL READERS

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	2.00	2.13	3.17	4.11	5.32	6.07	6.60	7.67	8.96	9.18	9.83	11.45	-	-	-	5.33	-	-
2*stdev	-	-	2.00	2.66	3.09	3.97	4.11	4.64	5.29	5.01	5.56	6.05	7.76	7.52	-	-	-	4.62	-	-
n	0	0	11	24	35	27	44	30	30	6	27	11	12	20	0	0	0	3	0	0

Table 5 - *L. budegassa* - Northern collection - 1st and 2nd reading. Average Percentage Error (APE), Coefficient of Variation (CV) and Index of Precision (D) estimated for all readers and for readers with experience (%).

		APE	CV	D	n
1st reading	All readers	36.3	44.5	18.3	61
	R1, R2, R5 and R8	8.8	11.4	5.8	61
2nd reading	All readers	10.1	18.3	6.5	35
	R1, R2, R5 and R8	10.1	13.5	6.8	35

Table 6 - *L. budegassa* credibility level percentages by reader for the Northern and Southern Collections (1st reading).

	R1 - Iñaki Quincoces		R2 - Asier Zamakona		R3 - Helen McCormick		R4 - Fiona Woods		R5 - Jorge Landa		R6 - Hervé Dupouy		R7 - Bernard Kergoat		R8 - Rafael Duarte	
Northern Collection	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%					Nº	%
High	6	8.8	6	8.8	16	23.5	39	57.4	15	22.1					3	4.4
Medium	46	67.6	59	86.8	32	47.1	14	20.6	35	51.5					47	69.1
Low	11	16.2	3	4.4	20	29.4	15	22.1	11	16.2					17	25.0
Unred.	5	7.4		0.0		0.0		0.0	7	10.3					1	1.5
Total	68		68		68		68		68						68	
Southern Collection	Nº	%	Nº	%					Nº	%	Nº	%	Nº	%	Nº	%
High	12	14.8	28	35.4					28	35.0	5	6.3		0.0		0.0
Medium	34	42.0	46	58.2					39	48.8	25	31.3	6	7.5	50	67.6
Low	31	38.3	4	5.1					10	12.5	47	58.8	74	92.5	23	31.1
Unred.	4	4.9	1	1.3					3	3.8	3	3.8		0.0	1	1.4
Total	81		79						80		80		80		74	

Table 7 - *L.budegassa* - Southern Collection - 1st Reading. Age attributed by reader and respective difference to the modal age.

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1		R2		R5		R6		R7		R8	
								Age	age-mode	Age	age-mode	Age	age-mode	Age	age-mode	Age	age-mode	Age	age-mode
6	1	6/1	210	jul.97	3.3	3.0	3	3	0	4	1	4	1	3	0	2	-1	3	0
6	2b	6/2b	220	jul.97	4.0	4.0	4	4	0	4	0	4	0	4	0	4	0	4	0
6	3	6/3	230	jul.97	4.0	4.0	4	4	0	4	0	-		4	0	4	0	4	0
6	6	6/6	240	jul.97	3.8	3.7	4	4	0	4	0	4	0	-		-		3	-1
15	2a	15/2a	255	jun.97	4.2	4.2	4	4	0	4	0	3	-1	5	1	5	1	4	0
15	7a	15/7a	260	jun.97	4.3	4.4	4	4	0	4	0	4	0	5	1	5	1	4	0
15	11a	15/11a	270	jun.97	4.3	4.4	4	4	0	4	0	4	0	4	0	6	2	4	0
20	1	20/1	280	oct.96	5.2	5.2	5	4	-1	5	0	5	0	5	0	7	2	5	0
20	3	20/3	290	oct.96	5.3	5.4	5	4	-1	5	0	5	0	6	1	7	2	5	0
20	6	20/6	300	oct.96	5.0	5.0	4	4	0	5	1	4	0	6	2	6	2	5	1
20	8	20/8	310	oct.96	5.5	5.4	5	4	-1	5	0	5	0	5	0	7	2	6	1
10	1	10/1	320	oct.96	4.8	4.8	5	5	0	5	0	4	-1	5	0	5	0	5	0
10	5	10/5	330	oct.96	4.7	4.6	5	5	0	5	0	5	0	4	-1	4	-1	5	0
10	9	10/9	340	dec.96	5.7	5.6	-	5		6		6		6		6		5	
10	10	10/10	350	nov.96	5.8	5.6	-	5		6		5		6		6		6	
1	5	1/5	360	nov.96	6.7	6.8	6	6	0	6	0	6	0	8	2	8	2	6	0
1	8 a	1/8 a	378	oct.96	6.8	6.8	-	6		7		7		7		8		6	
1	9	1/9	380	oct.96	6.8	6.8	6	6	0	7	1	6	0	8	2	8	2	6	0
1	14	1/14	390	nov.96	7.0	7.0	6	6	0	7	1	6	0	9	3	8	2	6	0
14	1	14/1	400	oct.96	6.3	6.0	6	6	0	8	2	5	-1	6	0	7	1	6	0
1	15	1/15	400	oct.96	7.3	7.4	7	6	-1	7	0	7	0	8	1	9	2	7	0
14	3	14/3	410	otc.96	7.0	6.8	-	6		7		6		7		8		7	
14	8a	14/8a	422	oct.96	7.0	7.0	7	7	0	7	0	6	-1	-		8	1	7	0
14	10	14/10	430	oct.96	7.7	7.8	8	7	-1	7	-1	6	-2	8	0	10	2	8	0
16	2a	16/2a	440	oct.96	6.8	6.6	6	7	1	8	2	6	0	6	0	8	2	6	0
16	7	16/7	457	dec.96	7.5	7.2	7	7	0	8	1	7	0	7	0	8	1	7	0
16	8b	16/8b	462	oct.96	8.5	8.6	-	8		8		9		8		9		9	
18	1a	18/1a	470	feb.97	7.8	7.8	7	8	1	8	1	7	0	10	3	7	0	7	0
18	7a	18/7a	480	feb.97	8.8	8.6	-	8		9		9		9		9		8	
2	1 a	2/1 a	490	feb.97	8.3	8.2	-	9		9		7		9		9		7	
3	2	3/2	510	sep.96	9.0	9.0	9	9	0	9	0	6	-3	11	2	10	1	9	0
3	7	3/7	530	sep.96	9.4	9.3	-	9		10		-		10		10		8	
3	10	3/10	540	sep.96	9.2	9.0	8	9	1	10	2	8	0	10	2	10	2	8	0
3	14	3/14	550	aug.96	10.0	10.0	11	9	-2	10	-1	8	-3	11	0	11	0	11	0
3	17	3/17	560	sep.96	9.2	8.8	8	9	1	11	3	8	0	8	0	9	1	10	2
11	11	11/11	560	dec.96	10.3	10.2	9	9	0	11	2	9	0	12	3	10	1	11	2
11	14	11/14	570	oct.96	9.8	9.6	9	9	0	11	2	9	0	11	2	10	1	9	0
5	2	5/2	580	oct.96	9.3	9.0	9	9	0	11	2	9	0	11	2	10	1	6	-3
5	10	5/10	590	dec.96	10.0	9.6	9	9	0	11	2	9	0	11	2	11	2	8	-1
9	1	9/1	600	jul.97	10.7	10.2	10	10	0	12	2	10	0	10	0	11	1	10	0
9	2	9/2	610	jul.97	11.0	11.0	11	11	0	12	1	11	0	12	1	11	0	10	-1

Table 7 - *L.budegassa* - Southern Collection - 1st Reading. Age attributed by reader and respective difference to the modal age (Cont.).

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	age-mode	R2 Age	age-mode	R5 Age	age-mode	R6 Age	age-mode	R7 Age	age-mode	R8 Age	age-mode
9	8	9/8	620	jul.97	11.5	11.4	12	10	-2	12	0	11	-1	12	0	12	0	12	0
9	13	9/13	630	aug.97	11.7	11.6	-	10		11		11		13		12		12	
9	16	9/16	640	jul.97	11.7	11.6	-	11		12		12		12		12		11	
4	5	4/5	650	jul.97	11.8	11.6	11	11	0	13	2	10	-1	13	2	13	2	11	0
4	7	4/7	660	jul.97	12.0	11.8	12	11	-1	13	1	12	0	12	0	12	0	12	0
4	11 a	4/11 a	670	sep.97	12.2	11.6	-	11		14		11		12		12		12	
4	14	4/14	680	jul.97	12.2	12.2	11	12	1	14	3	11	0	14	3	13	2	11	0
17	10	17/10	690	mai.97	11.2	10.4	10	10	0	14	4	10	0	10	0	11	1	11	1
17	12	17/12	700	jun.97	11.7	10.8	-	11		15		10		11		12		10	
13	6	13/6	710	mai.97	13.5	13.0	12	12	0	16	4	12	0	14	2	12	0	15	3
13	10	13/10	720	jun.97	12.8	12.2	12	12	0	16	4	12	0	14	2	12	0	11	-1
12	1	12/1	730	jun.97	12.5	11.8	12	12	0	15	3	11	-1	13	1	11	-1	12	0
13	11	13/11	730	mai.97	13.2	12.4	13	13	0	17	4	11	-2	12	-1	13	0	13	0
12	5	12/5	740	apr.97	13.2	12.6	13	13	0	16	3	11	-2	14	1	12	-1	13	0
12	8	12/8	750	apr.97	13.2	12.6	13	13	0	16	3	12	-1	13	0	11	-2	14	1
8	6	8/6	760	mai.97	14.4	13.8	14	13	-1	17	3	-		14	0	14	0	14	0
19	1a	19/1a	790	apr.97	14.7	13.8	-	13		18		13		15		13		15	
19	4	19/4	800	apr.97	14.3	13.0	12	14	2	20	8	12	0	13	1	14	2	12	0
19	6	19/6	810	apr.97	15.7	15.0	15	15	0	19	4	15	0	15	0	15	0	15	0
19	8	19/8	820	jun.97	15.3	14.8	15	15	0	18	3	12	-3	16	1	16	1	15	0
7	2	7/2	830	apr.97	14.2	13.6	13	15	2	17	4	13	0	13	0	14	1	13	0
7	4	7/4	840	mai.97	16.0	15.8	15	15	0	18	3	16	1	15	0	16	1	17	2
7	6	7/6	850	mai.97	14.0	12.6	13	14	1	20	7	13	0	11	-2	12	-1	13	0
7	7	7/7	870	apr.97	16.2	15.2	15	15	0	20	5	15	0	17	2	14	-1	15	0
7	9	7/9	880	apr.97	16.6	15.8	-	16		20		14		18		16		15	

Table 8 – *L. budegassa* - Southern collection - 1st reading.
By modal age are presented the average age recorded, 2*stdev and number of age readings by reader and of all readers.

READER 1

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.00	4.00	4.40	6.20	7.00	8.33	9.00	10.00	10.75	11.83	13.60	13.00	15.00	-	-	-	-	-
2*stdev	-	-	-	-	0.00	0	0.00	1.63	2.31	0.00	0.00	2.52	2.66	1.79	-	0.00	-	-	-	-	-
n	0	0	0	1	8	5	5	4	3	5	2	4	6	5	1	4	0	0	0	0	0

READER 2

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	4.00	4.13	5.00	7.20	7.50	9.33	10.60	13.00	12.25	15.33	17.20	17.00	18.75	-	-	-	-	-
2*stdev	-	-	-	-	0.71	0.00	0.00	1.15	4.16	1.79	2.83	3.42	5.61	3.29	-	1.91	-	-	-	-	-
n	0	0	0	1	8	5	5	4	3	5	2	4	6	5	1	4	0	0	0	0	0

READER 5

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	4.00	3.29	4.80	5.80	6.75	7.33	8.40	10.00	10.00	11.67	12.00	-	14.50	-	-	-	-	-
2*stdev	-	-	-	-	2.99	0.00	0.00	1.00	2.31	2.68	0.00	2.83	1.03	2.00	-	3.46	-	-	-	-	-
n	0	0	0	1	7	5	5	4	3	5	2	4	6	5	0	4	0	0	0	0	0

READER 6

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.00	4.14	5.00	7.40	8.33	8.67	11.20	10.00	12.50	13.00	12.60	14.00	15.75	-	-	-	-	-
2*stdev	-	-	-	-	3.15	0.00	0.00	3.06	2.31	0.89	0.00	2.58	1.79	2.28	-	1.91	-	-	-	-	-
n	0	0	0	1	7	5	5	3	3	5	2	4	6	5	1	4	0	0	0	0	0

READER 7

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	2.00	4.86	6.00	7.80	8.00	9.67	10.20	11.00	12.00	12.17	12.40	14.00	15.25	-	-	-	-	-
2*stdev	-	-	-	-	1.80	0.00	0.00	1.63	1.15	0.89	0.00	2.31	1.97	2.28	-	1.91	-	-	-	-	-
n	0	0	0	1	7	5	5	4	3	5	2	4	6	5	1	4	0	0	0	0	0

READER 8

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.00	3.88	5.20	6.00	7.00	8.67	8.60	10.50	10.75	12.33	13.20	14.00	15.50	-	-	-	-	-
2*stdev	-	-	-	-	1.28	0.00	0.00	0.00	2.31	3.63	1.41	1.00	2.73	0.89	-	2.00	-	-	-	-	-
n	0	0	0	1	8	5	5	4	3	5	2	4	6	5	1	4	0	0	0	0	0

ALL READERS

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.17	4.04	5.07	6.73	7.39	8.67	9.67	10.75	11.38	12.72	13.50	14.40	15.79	-	-	-	-	-
2*stdev	-	-	-	1.51	2.04	1.66	2.03	1.78	2.66	2.84	2.43	2.94	3.75	4.06	3.03	3.39	-	-	-	-	-
n	0	0	0	6	45	30	30	23	18	30	12	24	36	30	5	24	0	0	0	0	0

Table 9 - *L. budegassa* - Southern collection - 1st reading. Average Percentage Error (APE), Coefficient of Variation (CV) and Index of Precision (D) estimated for all readers and for readers with experience (%).

	APE	CV	D	n
All readers	9.4	12.6	5.2	66
R1, R5, R6 and R8	8.5	11.1	5.0	66

Table 10 - *L. budegassa* - Nothern Collection - 2nd Reading. Total results obtained by reader.

Sample	Order	Numb.	Length (mm)	Date	R1	R2	R3	R4	R5	R6	R7	R8	Modal Age(Expert)	Modal Age (All)
227	2b/2	227-2b/2	527	23-Jan-97	9	10	14	10		12	11	11	-	10
227	2b/6	227-2b/6	570	23-Jan-97	10	12	12	11	9	13	13	11	-	-
244	2b/1	244-2b/1	584	13-Fev-97	11	12	11	13	10	9	12	11	11	11
244	2b/2	244-2b/2	829	13-Fev-97	19	17	18	16	19	20	19	17	19	19
247	5b/3	247-5b/3	374	13-Fev-97	7	7	6	10	7	7	9	6	7	7
252	3a/4	252-3a/4	326	20-Fev-97	6	6	7	9	6	5	8	5	-	6
252	3b/1	252-3b/1	262	20-Fev-97	5	4	5	5	5	4	6	4	5	5
258	4a/3	258-4a/3	664	20-Fev-97	12	14	13	12	12	8	14	12	12	12
264	5a/1	264-5a/1	225	05-Mar-97	4	3	3	3	3		3	2	-	3
276	2b/2	276-2b/2	479	21-Mar-97	8	9	9	11	7	9	10	7	7	9
276	2b/4	276-2b/4	744	21-Mar-97	14	15	15	14	14	15	14	11	14	14
277	3a/5	277-3a/5	456	22-Mar-97	8	8	9	10	7	10	10	8	8	8
277	3b/4	277-3b/4	731	22-Mar-97	14	16	11	12	13	13	14	12	13	-
313	4b/4	313-4b/4	713	14-Abr-97	13	15	12	12	13	17	14	12	13	12
324	5a/1	324-5a/1	190	20-Mai-97	3	3	3	5	3	3	3	2	3	3
363	5a/1	363-5a/1	275	03-Nov-97	4	5	5	7	4	5	5	5	-	5
363	5b/3	363-5b/3	305	03-Nov-97	5	5	7	9	4	5	7	5	5	5
365	2b/5	365-2b/5	405	03-Nov-97	6	7	6	7	5	7	10	7	7	7
366	3a/6	366-3a/6	435	03-Nov-97	7	8	8	12	6	9	10	7	7	7
366	3b/3	366-3b/3	535	03-Nov-97	9	10	9	12	7	10	12	8	-	9
367	4b/9	367-4b/9	595	03-Nov-97	10	12	11	13	9	11	13	10	10	-
368	5a/6	368-5a/6	635	03-Nov-97	11	13	11	11	8	12	13	11	11	11
369	1a/1	369-1a/1	245	10-Nov-97	5	5	3	7	4	3	4	3	3	3
369	1b/2	369-1b/2	355	10-Nov-97	6	6	5	8	6	8	6	5	6	6
369	1b/5	369-1b/5	385	10-Nov-97	7	7	6	9	7	9	8	6	7	7
371	3a/1	371-3a/1	655	10-Nov-97	12	14	12	16	11	12	11	10	12	12
371	3a/4	371-3a/4	745	10-Nov-97	14	16	11	10	11	12	12	12	12	12
371	3b/1	371-3b/1	750	17-Nov-97	15	16	11	11	13	15	14	12	15	15
374	1b/2	374-1b/2	185	24-Nov-97	3	3	1	4	3	2	2	2	-	3
374	1b/7	374-1b/7	415	24-Nov-97	7	7	6	13	7	6	9	7	7	7
375	2a/2	375-2a/2	475	24-Nov-97	8	9	7	10	8	7	9	8	8	8
375	2b/2	375-2b/2	705	24-Nov-97	13	15	9	11	12	12	12	12	12	12
375	2b/6	375-2b/6	775	27-Nov-97	16	16	12	16	17	17	14	15	17	16
376	3a/4	376-3a/4	238	01-Dez-97	4	4	3	6	4	3	4	4	4	4
376	3b/8	376-3b/8	253	01-Dez-97	4	4	3	8	4	3	4	4	4	4

Table 11 - *L. budegassa* - Northern Collection - 2nd Reading. Age attributed by reader and respective diference to the modal age.

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	R1 age-mode	R2 Age	R2 age-mode	R3 Age	R3 age-mode	R4 Age	R4 age-mode	R5 Age	R5 age-mode	R6 Age	R6 age-mode	R7 Age	R7 age-mode	R8 Age	R8 age-mode
374	1b/2	374-1b/2	185	24-Nov	3	3	-	3		3		1		4		3		2		2		2	
324	5a/1	324-5a/1	190	20-Mai	3	3	3	3	0	3	0	3	0	5	2	3	0	3	0	3	0	2	-1
264	5a/1	264-5a/1	225	5-Mar	3	3	-	4		3		3		3		3				3		2	
376	3a/4	376-3a/4	238	1-Dez	4	4	4	4	0	4	0	3	-1	6	2	4	0	3	-1	4	0	4	0
369	1a/1	369-1a/1	245	10-Nov	4	4	3	5	2	5	2	3	0	7	4	4	1	3	0	4	1	3	0
376	3b/8	376-3b/8	253	1-Dez	4	4	4	4	0	4	0	3	-1	8	4	4	0	3	-1	4	0	4	0
252	3b/1	252-3b/1	262	20-Fev	5	5	5	5	0	4	-1	5	0	5	0	5	0	4	-1	6	1	4	-1
363	5a/1	363-5a/1	275	3-Nov	5	5	-	4		5		5		7		4		5		5		5	
363	5b/3	363-5b/3	305	3-Nov	6	5	5	5	0	5	0	7	2	9	4	4	-1	5	0	7	2	5	0
252	3a/4	252-3a/4	326	20-Fev	7	6	-	6		6		7		9		6		5		8		5	
369	1b/2	369-1b/2	355	10-Nov	6	6	6	6	0	6	0	5	-1	8	2	6	0	8	2	6	0	5	-1
247	5b/3	247-5b/3	374	13-Fev	7	7	7	7		7	0	6	-1	10	3	7	0	7	0	9	2	6	-1
369	1b/5	369-1b/5	385	10-Nov	7	7	7	7	0	7	0	6	-1	9	2	7	0	9	2	8	1	6	-1
365	2b/5	365-2b/5	405	3-Nov	7	6	7	6	-1	7	0	6	-1	7	0	5		7	0	10	3	7	0
374	1b/7	374-1b/7	415	24-Nov	8	7	7	7	0	7	0	6	-1	13	6	7	0	6	-1	9	2	7	0
366	3a/6	366-3a/6	435	3-Nov	8	7	7	7	0	8	1	8	1	12	5	6	-1	9	2	10	3	7	0
277	3a/5	277-3a/5	456	22-Mar	9	8	8	8	0	8	0	9	1	10	2	7	-1	10	2	10	2	8	0
375	2a/2	375-2a/2	475	24-Nov	8	8	8	8	0	9	1	7	-1	10	2	8	0	7	-1	9	1	8	0
276	2b/2	276-2b/2	479	21-Mar	9	8	7	8	1	9	2	9	2	11	4	7	0	9	2	10	3	7	0
227	2b/2	227-2b/2	527	23-Jan	11	11	-	9		10		14		10				12		11		11	
366	3b/3	366-3b/3	535	3-Nov	10	9	-	9		10		9		12		7		10		12		8	
227	2b/6	227-2b/6	570	23-Jan	11	11	-	10		12		12		11		9		13		13		11	
244	2b/1	244-2b/1	584	13-Fev	11	10	11	11	0	12	1	11	0	13	2	10	-1	9	-2	12	1	11	0
367	4b/9	367-4b/9	595	3-Nov	11	10	10	10	0	12	2	11	1	13	3	9	-1	11	1	13	3	10	0
368	5a/6	368-5a/6	635	3-Nov	11	11	11	11	0	13	2	11	0	11	0	8	-3	12	1	13	2	11	0
371	3a/1	371-3a/1	655	10-Nov	12	11	12	12	0	14	2	12	0	16	4	11	-1	12	0	11	-1	10	-2
258	4a/3	258-4a/3	664	20-Fev	12	11	12	12	0	14	2	13	1	12	0	12	0	8	-4	14	2	12	0
375	2b/2	375-2b/2	705	24-Nov	12	12	12	13	1	15	3	9	-3	11	-1	12	0	12	0	12	0	12	0
313	4b/4	313-4b/4	713	14-Abr	14	14	13	13	0	15	2	12	-1	12	-1	13	0	17	4	14	1	12	-1
277	3b/4	277-3b/4	731	22-Mar	13	13	13	14	1	16	3	11	-2	12	-1	13	0	13	0	14	1	12	-1
276	2b/4	276-2b/4	744	21-Mar	14	14	14	14	0	15	1	15	1	14	0	14	0	15	1	14	0	11	-3
371	3a/4	371-3a/4	745	10-Nov	12	12	12	14	2	16	4	11	-1	10	-2	11	-1	12	0	12	0	12	0
371	3b/1	371-3b/1	750	17-Nov	13	14	15	15	0	16	1	11	-4	11	-4	13	-2	15	0	14	-1	12	-3
375	2b/6	375-2b/6	775	27-Nov	15	16	17	16	-1	16	-1	12	-5	16	-1	17	0	17	0	14	-3	15	-2
244	2b/2	244-2b/2	829	13-Fev	18	19	19	19	0	17	-2	18	-1	16	-3	19	0	20	1	19	0	17	-2

Table 12 – *L. budegassa* - Northern collection - 2nd reading.
By modal age are presented the average age recorded, 2*stdev and number of age readings by reader and of all readers.

READER 1

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	4.00	4.00	5.00	6.00	7.00	8.00	-	10.00	11.00	12.75	13.50	14.00	15.00	-	16.00	-	19.00
2*stdev	-	-	-	2.83	0.00	0.00	-	1.26	0.00	-	-	0.00	1.91	1.41	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

READER 2

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	4.00	4.00	4.50	6.00	7.50	8.50	-	12.00	12.50	14.75	15.50	15.00	16.00	-	16.00	-	17.00
2*stdev	-	-	-	2.83	0.00	1.41	-	1.67	1.41	-	-	1.41	1.91	1.41	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

READER 3

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	3.00	3.00	6.00	5.00	6.83	8.00	-	11.00	11.00	11.25	11.50	15.00	11.00	-	12.00	-	18.00
2*stdev	-	-	-	0.00	0.00	2.83	-	2.66	2.83	-	-	0.00	3.42	1.41	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

READER 4

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	6.00	7.00	9.00	8.00	10.20	10.00	-	13.00	12.00	12.33	-	-	-	-	-	-	11.00
2*stdev	-	-	-	2.83	2.83	-	-	4.77	-	-	-	-	6.43	-	-	-	-	-	-	-
n	0	0	0	2	2	1	1	5	1	0	1	2	3	0	0	0	0	0	0	1

READER 5

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	3.50	4.00	4.50	6.00	6.50	7.50	-	9.00	9.00	11.50	13.00	14.00	13.00	-	17.00	-	19.00
2*stdev	-	-	-	1.41	0.00	1.41	-	1.67	1.41	-	-	2.83	1.15	0.00	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

READER 6

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	3.00	3.00	4.50	8.00	7.83	8.50	-	11.00	10.50	11.00	15.00	15.00	15.00	-	17.00	-	20.00
2*stdev	-	-	-	0.00	0.00	1.41	-	2.66	4.24	-	-	4.24	4.00	5.66	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

READER 7

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	3.50	4.00	6.50	6.00	9.33	9.50	-	13.00	12.50	12.25	14.00	14.00	14.00	-	14.00	-	19.00
2*stdev	-	-	-	1.41	0.00	1.41	-	1.63	1.41	-	-	1.41	2.52	0.00	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

READER 8

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	2.50	4.00	4.50	5.00	6.67	8.00	-	10.00	11.00	11.50	12.00	11.00	12.00	-	15.00	-	17.00
2*stdev	-	-	-	1.41	0.00	1.41	-	1.03	0.00	-	-	0.00	2.00	0.00	-	-	-	-	-	-
n	0	0	0	2	2	2	1	6	2	0	1	2	4	2	1	1	0	1	0	1

ALL READERS

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	3.69	4.13	5.33	6.25	7.68	8.40	-	11.13	11.19	12.16	13.50	14.00	13.71	-	15.29	-	17.50
2*stdev	-	-	-	2.50	2.52	2.79	2.33	3.29	2.11	-	2.92	2.75	3.58	3.31	2.83	3.60	-	3.60	-	5.66
n	0	0	0	16	16	15	8	47	15	0	8	16	31	14	7	7	0	7	0	8

Table 13 - *L. piscatorius* - Northern Collection - 1st Reading. Total results obtained by reader.

I.D. (Plate-Num.)	Length (cm)	Date (dd-mm-yy)	R1 - Iñaki Quincoces Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R2 - Asier Zamakona Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R3 - Helen McCormick Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R4 - Fiona Woods Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R5 - Jorge Landa Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R6 - Hervé Dupouy Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R7 - Bernard Kergoat Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.	R8 - Rafael Duarte Age	Diam. Vert.	Horiz.	Border	Cred.	Comm.
207-2a/5	37	01-22-97	5	60	140			M	3	160	240	H	Med.		2	300	300	T	H		3			T	H		4	70	150	o	h		4	120	200	H	b		4	100	160		b		5	70	163		h	
207-2b/3	109	01-22-97	15	90	180			M	14	415	565	H			8	320	540	T	B		10			T	B		19	120	310	h	m		14	200	370	H	c		12	250	420		b		19	91	267		b/m	
207-2b/5	42	01-22-97	6	80	200			M	4	220	325	H	Med.		4	160	220	T	B		9			T	M		5	80	210	h	m		5	160	280	O	b		5	150	220		b		7	86	199		b/m	
209-4b/2	43	01-22-97	6	60	170			M	4	140	235	H	Med.		3	100	220	O	B		11			T	M		5	80	170	o	h		5	120	220	O	b		5	120	220		b		8	73	173		m	
209-4b/3	25	01-22-97	3	90	180			M	2	125	225	H	Bad		1	200	300	T	H		2			T	H		2	80	160	o	m		2	100	190	H	b		3	80	160		b		2	65	150		m	
209-4b/4	65	01-23-97	11	70	130			M	7	250	290	H			8	240	240	T	B		11			T	B		9	70	120	h	b		8	120	190	H	c		7	120	170	m			10	63	125		m	
209-4b/5	97	01-23-97	14	90	230			M	11	260	390	H	Med.		7	240	400	T	B		8			T	B		13	100	140	o	m		13	160	270	O	c		12	150	240		b		15	85	221		m	
211-1a/5	72	01-23-97	9	120	230			M	8	340	405	H	High		8	200	380	T	M		8			T	B		9	140	250	h	h		9	170	230	H	c		9	130	220	m			12	102	231		m	
211-1b/1	58	01-23-97	8	160	310			M	6	310	420	H	High		4	320	480	T	M		5			T	B						m		6	160	320	H	b		5	200	300		b		8	134	293		m	
213-3b/5	93	01-24-97	13	190	310			M	11	315	420	H	Med.		8	300	320	T	M		14			T	B								11	170	300	H	c		10	110	160	m			14	91	231		m	
214-4a/6	82	01-24-97	11	140	330			M	10	350	530	H	Med.		6	400	500	T	M		10			T	B		10	70	270	h	h		10	150	350	H	c		8	100	180		b		14	91	272		b/m	
216-1b/2	34	01-25-97	4	130	230			M	3	200	315	H	High		2	200	300	T	M		5			T	B		4	70	190	o	b		3	150	270	O	b		4	100	130		b		5	59	172		b/m	
217-2a/1	62	01-25-97	8	100	190			M	7	250	350	H	Med.		6	100	200	T	B		7			T	B		8	110	200	h	m		8	140	230	O	h		7	80	130	m			9	80	169		m	
217-2a/2	59	01-25-97	8	80	190			M	6	320	390	H	Med.		5	300	400	T	M		5			T	B		9	80	180	h	h		7	150	260	O	b		7	80	130	m			10	71	173		m	
217-2a/6	31	01-25-97	4	80	200			M	3	160	285	H	Med.		2	160	240	T	M		3			T	M		4	80	200	h	b		3	130	230	H	b		3	50	110		b		3	63	183		m	
217-2b/2	62	01-25-97	8	120	300			M	7	350	500	H	Med.		7	100	280	T	M		8			T	M		8	90	240	o	b		8	150	340	H	c		6	150	190		b		9	73	221		m	
225-5a/4	48	01-27-97	6	160	270			H	5	200	300	H	High		6	200	300	T	U		7			T or O	B		6	60	280	o	h		5	170	280	O	b		5	90	140	m			6	65	185		m	
238-1a/3	118	02-13-97	17	170	300			M	13	320	430	H	Med.		6	200	260	T	M		6			T	H		16	120	230	h	m		14	160	270	O	c		11	100	160	m			20	88	212		m	
240-3a/1	76	02-13-97	10	120	260			M	9	400	490	H	High		7	100	240	T	B		7			T	H		11	130	250	h	m		10	160	330	H	c		8	100	170	m			12	58	202		m	
240-3b/5	48	02-15-97	6	120	260			M	5	640	815	H	High		6	100	240	T	M		7			T	H		5	100	200	o	m		5	180	300	H	b		5	90	140		b		6	95	205	6+	m	
265-1b/6	70	03-03-97	9	200	290			M	9	355	460	H	High		7	220	320	O	M		8			T	H		10	90	200	h	m		8	180	300	O	c		9	150	230		b		10	101	222		b/m	
266-2a/1	86	03-03-97	12	120	230			M	10	440	505	H	Med.		9	140	240	O	M		10			T	M		11	90	200	o	m		11	150	230	O	c		11	110	230	m			10	99	208	10,14+	b/m	
266-2b/6	32	03-06-97	4	80	230			M	3	265	380	H	Med.		3	200	320	T	M		5			T	B		3	70	170	o	b		3	150	250	H	c		4	110	210	m			5	53	183	5+	m	
272-3b/4	128	03-21-97	24	250	320			M	22	355	480	H	High		11	340	400	T	M		11			T	M		21	80	220	h	m		16	230	350	H	c		18	120	250	m			20	72	207	20+	b/m	
286-2a/1	40	03-23-97	6	150	250			M	4	210	300	H	High		4	80	200	T	M		8			T	M		4	70	200	o	b		4	170	250	O	b		5	110	230		b		6	53	178	6+	m	
286-2b/2	136	04-10-97	28	170	250			M	25	380	455	H	High		13	100	260	T	B		9			T	B		22	80	180	h	m		20	150	240	H	c		22	100	180		b		25	77	179		m/h	
287-3b/1	91	04-10-97	12	70	180			B	11	555	665	H			5	100	220	O	M		5			T	M		12	70	180	o	m		11	200	300	H	c		11	110	200		b		16	57	166	16+	m	
288-4a/1	79	04-10-97	10	140	330			M	9	445	550	H	High		6	180	300	O	B		4			T	M		9	130	270	o	m		10	200	350	O	c		9	150	260	m			13	126	266		m	
288-4a/4	24	04-10-97	3	100	190			M	2	140	233	H	Med.		2	100	200	T	M		1			T	B		2	70	170	o	m		2	120	210	H	b		2	100	190		b		3	47	149	3+	b	
288-4a/5	26	04-10-97	3	185	90			M	2	173	250	H	Med.		3	100	220	T	M		1			T	B		2	70	150	o	h		3	110	180	H	b		3	90	160		b		3	55	134	3+	b	
293-4b/5	46	04-10-97	6	110	180			M	5	245	293	H	Med.		4	200	200	T	M		5			T	M		5	110	200	o	m		4	130	200	O	b		5	130	180		b		5	100	165	6+	m	
294-5a/6	38	04-10-97	5	110	210			M	4	230	300	H	High		4	100	200	T	H		4			T	B		4	90	200	o	m		4	140	220	O	b		4	110	200		b		5	75	157	5+	m	
302-3a/6	85	04-14-97	11	135	290			M	10	460	610	H	Med.		6	300	480	T	H		5			T	B		11						8	200	350	O	c		9	140	260		b		13	84	204		b/m	
309-5b/3	51	04-14-97	7	80	145			M	5	310	370	H	High		5	80	140	O	M		6			T	M		6	70	150	o	h		5	170	220	O	c		6	180	250	h			7	60	138		m	
309-5b/4	51	04-14-97	7	110	210			M	5	300	385	H	High		5	100	220	O	M		5			T	B		6	70	200	h	h		6	150	230	O	h		6	90	200	h			7	55	156		m	
315-1a/2	74	05-16-97	10	160	300			B	8	305	420	H	Med.		7	140	320	T	M		6			T	H		9	160	300	h	m		7	200	320	H	credibility		7	170	300	m			9	67	168	9+	m	
334-1a/3	31	11-10-97	3					B	3	190	200		Med.		1	260	260	T	M		1			T	B		3	40	90	o	m		2	160	170	O	b		2	160	160		b		3	46	78		b	
338-5a/3	67	11-10-97	8	110	240			M	8	520	610		High		3	200	380	T	M		4			T	B		8	110	220	o	h		7	130	250	O	c		8	110	220	m			10	96	228		m	
338-5b/1	82	11-10-97	11	130	250			M	11	440	575	H	Med.		7	300	500	T	B		7			T	B		12	70	210	o	m		11	160	300	H	b		9	170	300	b			14	80	194		m	
339-1a/2	87	10-13-97	11	180	270			M	13	360	490	H	Med.		5	300	440	T	B		5			T	M		10	120	260	o	m		9	160	300	H	m		10	180	300	m			11	86	234		m	
339-1b/4	74	10-13-97	9					B	9	385	555	H	Med.		7	140	320		H		8			T	B						u		7	200	350	O	c		9	230	320	b			10	93	250		m	
340-2a/2	49	10-13-97	6	110	230			M	5	250	360	H	Med.		5	220	320	T	H		6			O	M		6	100	200	h	h		5	200	280	H	c		6	150	210		b		6	90	198		m	
340-2b/4	79	10-13-97	10	120	230			B	10	290	410	O	Med.		5	260	400	T	H		5			T	B		6						7	200	350	O	c		7	150	270		b		8	56	176		b/m	
345-2b/3	33	11-03-97	4	110	220			B	4	230	330	H	Med.		1	140	260	H	M		3			O	B		4	120	210	o	h		3	150	210	O	b		3	110	220	b			5	92	167	b+	m	
345-2b/5	35	11-03-97	4					M	4						1	200	300	T	M		4			T	M		4	70	160	o	h		3	150	240	H	m		4	70	150	h			4	55	145	b+	m	
345-2b/7	36	11-03-97	4	140	230			B	4	310	380	H	Med.		2	100	200	T	B		3			O	H		4	80	180	o	h		3	180	230	O	b		4	150	240	b			5	76	219	b+	m	
346-3a/7	38	11-03-97	4	130	240			M	4	330	430	H	High		5	220	300	T	B		2			T	B			60	200		u		4	190	250	O	b		4	220	320	b			6	61	180	b+	m	
346-3a/9	39	11-03-97	4	120	190			M	4	245	310	H	High		3	200	240	T	B		3			O	B		4	60	130	o	m		3	180	240	O	b		4	170	250	b			6	76	163		m	
346-3b/4	40	11-03-97	5	120	230			M	4	290	350	H	High		3	200	300	T	B		5			T	B		3	100	180	o	m		3	150	220	O	b		4	180	280	b			6	80	186		m	
347-4a/2	41	11-03-97	5	110	210			M	4	250	320	H	High		3	100	220	T	M		3			T	B		5	110	210	o	b		4	200	260	O	c		5	120	220		b		5	92	188		m	
347-4a/3	43	11-03-97	5	65	120			M	4	220	310	H	High		3	280	300	T	M		6			T	B		5	70	220	o	h		4	150	190	O	h		4	70	120		b		6	55	114		m	
347-4b/8	44	11-03-97	5	130	260			M	5	210	380	H	Med.		3	100	240	T	M		2			T	H		4	60	190	o	m		4	140	270	O	b		4	130	250		b		6	125	268		b/m	

I.D. (Plate-Num.)	Length (cm)	Date (dd-mm-yy)	R1 - Iñaki Quincoces						R2 - Asier Zamakona						R3 - Helen McCormick						R4 - Fiona Woods						R5 - Jorge Landa						R6 - Hervé Dupuoy						R7 - Bernard Kergoat						R8 - Rafael Duarte					
			Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.	Age	Vert.	Horiz.	Border	Cred.	Comm.
348-5a/6	48	11-03-97	6	80	210		H		5	270	350	O	High		4	200	340	T	M		3			T	H		6			o	m		5	170	300	O	c		5	150	280		b		7	89	210		b/m	
348-5a/7	48	11-03-97	6	160	260		M		6	270	340	H	High		4	200	300	T	M		5			T	H	Section with Blue Marker	5	180	270	H	c		5	150	280		b								6	95	187		b/m	
348-5a/9	40	11-03-97	6	90	190		M		5	370	425	H	M		5	80	200	T	M		4			T	H	With Red Marker(2nd last on slide)	6	170	270	O	b		6	120	250		b		7	120	250		b		8	84	190		b/m	
348-5b/2	50	11-03-97	6	110	200		H		5	179	265	H	High		5	80	200	T	M		4			T	H		6	80	150	o	h		6	200	250	O	h		6	150	250		b		6	68	154	b6ou7	m	
349-1b/0	62	11-03-97	8	170	220		M		7	345	400	H	High		9	140	200	T	B		5			T	H		9	90	160	o	b		7	150	220	H	b						a		10	78	157		m/h	
350-2a/1	63	11-03-97	8	130	210		B		7	470	540		High		5	200	300	T	B		5			T	H		8	60	160	o	b		7	130	210	O	b		7	160	200		b		10	78	163		m	
351-3a/1	84	11-03-97							11	405	590	H	Med.							U	7			T	M	Totally u	9	80	220	o	m		10	200	350	H	b		9	200	300		b		10	79	241	b+	m	
351-3a/3	92	11-03-97	13	210	360		H		16	435	560	H	Med.		18	100	300	T	B		14			T	B		15	130	250	H	m		13	80	230		b		13	85	236		m	
351-3a/5	103	11-03-97	17	300	400		B		19	385	400	H	Med.		7	100	240	T	M		9			T	B		12				m		15	140	200	H	c		13	180	300		b		15	78	203		m	
351-3a/6	124	11-03-97	22	150	320		B		22	245	405	H	Med.		7	100	300	T	M		5			T	B		15	100	260	h	m		17	160	300	O	c		14	160	300		b		15	92	269		m	
351-3b/1	91	11-17-97	12	240	350		B		14	540	605	H	Med.		6	100	240	T	M								13	100	190	o	h		14	160	300	O	b		12	200	300		b		12	82	218		m	
351-3b/2	91	11-17-97	13	210	330		M		14	550	695	H	Med.		5	340	500	T	B		10			T	B		11	200	340	O	c		9	180	320		b		12	81	236		m	
351-3b/6	114	11-17-97	18	180	195		M		20	520	520	H	Med.		7	520	540	O	H		7			O	H		15	70	100	o	m		14	120	190	H	b		11	180	200		b		16	78	93		m	
352-4a/2	71	11-17-97	10	140	330		H		8	415	565	H	High		11	140	320	T	H		9			T	H		10	80	260	o	h		9	180	330	O	h		10	150	200		m		11	62	230		m	
354-1a/2	75	11-24-97	10	160	230		M		9	380	450	H	Med.		4	160	240	T	H		7			T	M		10	60	150	o	m		10	140	260	O	b		9	120	250		b		12	60	150	b+	m	
354-1a/3	79	11-24-97	11	110	260		M		10	510	630	H	Med.		7	120	300	T	M		7			T	M		11	100	250	o	h		11	130	250	O	c		9	110	270		b		11	57	194	b+	m	
356-3a/4	100	12-01-97	14	180	210		M		17	420	450	H	Med.		6	440	400	T	H		6			T	B		13	60	120		b		15	130	220	H	b		11	150	250		b		14	72	126	b+	m	
356-3a/5	96	12-01-97	13	130	260		B		17	405	400	H	Med.		11	100	200	T	H		7			T	B		14	120	200	h	m		15	110	100	O	c		12	100	200		m		15	86	180		m	
357-4a/1	91	12-01-97		180	250				14	455	415	H	Med.		13	100	200	T	M		*			T	B	*Old valu	15	70	150	o	m		14	140	210	O	m	Length??	13	170	260		m	Length??	13	66	145		m	
357-4b/4	28	12-01-97	3				B		3	170	223	H	Med.		0	220	320	T	H		1			T	B		15	60	80	o	m		2	120	230	O	b		2	100	160		b		3	55	123	b+	m	
357-4a/6	112	12-01-97	19	170	240		M		21	440	490	H	Med.		9	200	220	T	B		10			T	B		19	100	180	o	m		17	120	230	H	c		12	250	300		m		20	88	170		m	

Table 14 - *L. piscatorius* - Southern Collection - 1st Reading. Total results obtained by reader.

I.D. (Plate-Num.)	Length (cm)	Date mouth	R1 Age	R1 Vert.	R1 Horiz.	R1 Cred.	R2 Age	R2 Vert.	R2 Horiz.	R2 Border	R2 Cred.	R3 Age	R3 Vert.	R3 Horiz.	R3 Border	R3 Cred.	R3 Comm.	R4 Age	R4 Border	R4 Cred.	R5 Age	R5 Vert.	R5 Horiz.	R5 Border	R5 Cred.	R6 Age	R6 Vert.	R6 Horiz.	R6 Border	R6 Cred.	R6 Comm.
6/3h/1	23	4	3			Medium	2	160	210	Med.	O	1	240	300	H	T		2	H	O	2	60	150	m	o	3	56	149	m/h	b-	
6/3h/2	23	4	3	70	150	Medium	2	150	210	High	O	1	240	320	H	T		2	H	O	3	60	150	m	o	3	49	127	h	b-	
6/3h/4	26	4	3	70	190	High	3	160	260	High	O	1	240	360	H	T		2	H	O	2	50	170	h	o	3	48	164	m	b+	
12/1a/1	25	9	3	150	270	Medium	3	250	340	High	H	1	300	400	M	T		2	H	O	3	60	200	h	o	3	89	203	m	b+	
12/1a/2	40	9	5	120	250	Medium	4	210	348	Med.	H	2	300	420	M	T		4	M	O	4	60	200	h	o	4	71	208	m	b+	
12/1a/3	42	7	5	160	280	Medium	4	250	375	Med.	H	2	240	400	M	T		5	H	O	4	100	230	h	o	4	76	223	m	b+	
14/3h/1	19	9	2	85	190	Bad	2	145	250	Med.	H	0	140	220	H	T		1	M	O	1	80	200	h	o	1	67	182	h	b+	
14/3h/2	19	9	2	80	170	Medium	2	90	185	Med.	H	0	120	240	H	T		1	M	O	1	60	150	h	o	1	53	155	h	b+	
14/3h/3	31	8	4	70	190	Medium	3	198	315	High	H	1	300	400	H	T		3	M	O	3	70	170	h	o	3	69	186	m/h	b-	
14/3h/5	33	7	4	170	250	Medium	4	170	210	Med.	H	2	180	300	M	O		3	M	O	3	70	160	m	o	3	61	154	m	b+	
3/2a/1	34	3	4	190	260	Bad	4	190	215	High	H						Unreadable	3	H	T	4	60	150	h	h	4	89	186	m/h	b-	
13/1a/3	37	9	4	160	230	Medium	4	180	330	High	H	1	300	400	D	T		3	H	O	3	80	210	h	o	3	73	208	m/h	b+	
13/1a/4	39	7	5	140	210	Medium	4	260	330	High	H	2	300	400	B	O		4	M	T	5	100	170	m	o	4	103	192	m/h	b+	
13/1b/1	43	9	5			Medium	5	300	358	Med.	H	1	460	440	B	T		6	M	T	5	70	170	h	o	5	85	181	m/h	b+	
13/1b/2	44	7	5	130	250	Medium	5	200	315	Med.	H	4	200	300	B	O		5	M	T	5	60	170	h	o	5	93	239	h	b+	
13/1b/4	45	9	5	160	210	Medium	5	240	268	Med.	O	3			M	T		7	M	T	5	50	120	m	o	5	101	181	m	b+	
13/1b/5	46	8	5	150	200	Medium	5	220	275	Med.	H	3	200	300	B	T		6	M	T	6	90	160	m	o	5	80	162	m	b+	
9/1a/1	50	5	6	130	170	Medium	5	250	270	Med.	O	5	440	440	M	T		4	M	T	6	50	90	m/h	b+	6	59	122	m/h	b+	
9/1a/3	52	4	6	250	340	Medium	6	340	450	Med.	H	5	200	360	M	T		6	M	T	6	80	170	m/h	o	7	56	164	m/h	b+-	
9/1a/4	53	5	7	200	260	Medium	6	290	360	Med.	H	6	100	180	M	T		7	H	T	7	60	150	m	o	7	54	149	m	b+	
9/1a/5	54	6	7			Medium	6	335	370	Bad	O	5	100	200	H	O		8	M	T	6	50	160	m	o	7	68	164	b	b+	
15/2h/1	55	7	7	210	290	Medium	6	220	290	Med.	H	4	200	240	H	T		5	H	T	7	80	180	m	o	7	67	175	m		
15/2h/4	56	9	7	200	290	Medium	6	315	405	Med.	H	7	100	240	M	T		6	M	O	7	100	180	h	o	7	73	180	m	b+	
13/2h/1	55	8	7	180	310	Medium	6	365	490	Med.	O	8	140	300	M	T		7	H	T	7	70	220	h	o	8	57	212	m	b+	
13/2h/5	60	7	7	200	310	Medium	7	395	535	Med.	O	6	100	220	H	O		8	M	T	7	100	180	m	o	8	63	188	m	b+-	
3/5a/4	61	2	8	170	270	High	7	445	545	High	O	11	120	320	M	T		9	M	T	6	80	200	m	o	6	86	220	m	b+-	
3/5b/3	64	2	8	130	270	High	7	485	620	High	O	10	120	320	H	T		9	M	T	8	100	250	m	o	8	63	218	m	b-	
7/4a/1	63	5	8	150	260	High	7	370	475	Med.	H	6	100	220	H	T		6	M	T	8	80	180	m	o	8	60	183	m	b+	
7/4a/4	65	6	8	180	270	High	7	325	430	High	H	6	120	220	H	T		6	B	T	9	80	160	m	o	8	77	155	m	b+	
7/4b/2	67	5	8	230	340	High	8	320	420	Med.	H	5	220	320	M	T		7	B	T	7	110	200	m	o	8	109	215	m	b-	
7/4b/4	68	5	9	140	230	Medium	8	415	515	Med.	O	7	180	260	B	T	y diffuse r	6	B	T	8	110	200	m	o	9	90	183	m		
12/3a/1	71	9	9	280	200	Medium	8	420	490	Med.	H	7	140	240	M	O		9	B	T	9	70	200	m	o	9	82	189	m		
12/3a/3	73	9	9	210	290	Medium	9	475	515	Med.	H	7	100	220	H	T		9	D	T	9	60	220	m	o	10	78	167	b		
15/5h/1	72	8	10	140	280	Medium	9	280	430	Med.	H	5	200	360	H	T		11	D	T	10	50	200	m	o	9	54	210	b/h		
15/5h/2	73	9	9	150	250	Medium	9	260	350	Med.	H	4	120	240	M	T		9	M	T	10	50	160	m	o	11	77	192	m	b+	
15/5h/4	74	8	9	120	290	Medium	9	430	620	Med.	H	4	120	280	M	T		10	B	T	9	50	240	m	o	14	81	229	m	b+	
2/3a/1	75	2	10	180	270	Medium	9	490	585	Med.	H	9	120	220	M	T		5	B	T	11	70	170	h	o	13	62	184	b		
2/3a/2	76	2	10	140	280	Medium	9	400	535	Med.	H	9	100	280	H	T		9	B	T	11	70	220	m	o	10	81	209	b/m	b+	
2/3a/3	77	2	10	140	310	Medium	10	440	540	Med.	O	10	140	300	B	T		7	B	T	14	60	210	m	h	13	54	210	m	b-	g over the
2/3a/4	77	2	10	140	290	Medium	10	430	535	Med.	H	7	100	220	B	O		8	B	O	11	60	220	m	o	13	56	205	m	b+-	
2/3h/1	79	2	10	130	260	Medium	10	310	395	Med.	H	6	200	340	H	T		7	B	T	11	80	210	m	h	11	61	201	b/m		
2/3h/2	79	3	10	190	310	Medium	10	295	435	Med.	H	5	200	300	H	T		3	M	O	12	70	200	m	h	13	54	200	m	b-	
2/3h/4	81	3	10	110	240	Medium	10	275	420	High	O	10	120	260	D	T	cult to see	9	D	O	14	70	190	m	o	11	82	209	m		
2/3h/5	81	3	11	100	280	Medium	10	365	455	High	H	8	140	220	B	T	ht or dou	6	H	T	13	70	160	h	h	12	69	166	m		
13/4h/2	84	9	11	200	300	Medium	11	275	390	High	O	8	100	200	H	T		8	M	T	12	80	210	h	o	14	82	201	m/h	b-	
13/4h/3	85	9	11	200	300	Medium	11	455	510	Med.	O	7	140	240	H	T		7	H	T	11	90	200	h	o	13	76	190	m	b-	
13/4h/5	86	9	11	150	260	Medium	11	375	500	Med.	O	9	100	240	H	T		8	M	T	12	90	220	h	o	13	65	180	b/m	b+	
5/3a/1	89	2	12	170	270	Medium	12	320	455	High	H	10	100	240	M	T	t read after	7	M	T	13	70	200	h	h	15	63	184	m/h		
5/3a/3	90	3	12	140	270	Medium	12	375	500	Med.	H	8	140	260	U	T		8	M	T	11	140	250	h	h	15	90	232	m	b-	
5/3a/4	91	2	12	150	260	Medium	12	600	710	Med.	H	9	100	200	H	T		10	M	T	13	80	190	h	h	15	73	190	m	b-	
13/5h/2	94	9	12			Medium	13	370	415	Med.	O	10	240	300	M	O		10	M	T	13	100	200	m	o	15			b		nucleus dama.
13/5h/3	94	9	13	180	300	Medium	13	345	440	Med.	H	7	180	300	U	O		7	B	T	11	90	200	m	o	14	77	197	m		
10/2h/1	93	5	12	190	290	Medium	13	400	490	Med.	H	9	200	400	B	O		10	B	T	13	110	270	m	o	18	64	192	m	b+	
10/2h/4	94	6	13	180	270	High	13	450	540	Med.	H	8	100	240	B	O		11	B	T	12	100	200	h	o	20	73	166	m	b-	
16/4h/1	98	9	13	130	270	Medium	14	395	520	Med.	O	11	120	260	H	O		10	D	O	13	100	260	m	o	17	61	217	b		
16/4h/2	98	9	14	170	290	Medium	14	520	650	Med.	O	13	100	240	M	O		9	H	O	14	100	160	m	o	20	71	162	m	b+	
16/4h/3	99	9	14	180	340	Medium	14	500	680	Med.	O	11	100	240	M	T		9	M	T	12	70	230	m	o	20	75	228	m	b+	
	100	9	14	190	140	Medium	14	445	660	Med.	O	7	120	340	M	T					12	80	300	m	o	15	80	278	b/m		

Table 14 - *L. piscatorius* - Southern Collection - 1*st* Reading. Total results obtained by reader (Cont.).

I.D. (Plate-Num.)	Length (cm)	Date mouth	R1 Age	R1 Vert.	R1 Horiz.	R1 Cred.	R1 Border	R1 Comm.	R2 Age	R2 Vert.	R2 Horiz.	R2 Border	R2 Cred.	R2 Comm.	R3 Age	R3 Vert.	R3 Horiz.	R3 Border	R3 Cred.	R3 Comm.	R4 Age	R4 Vert.	R4 Horiz.	R4 Border	R4 Cred.	R4 Comm.	R5 Age	R5 Vert.	R5 Horiz.	R5 Border	R5 Cred.	R5 Comm.	R6 Age	R6 Vert.	R6 Horiz.	R6 Border	R6 Cred.	R6 Comm.
5/5a/2	103	3	15	250	340	Medium			14	450	570	High	O		13	200	300	D	T		9			M	T		15	110	200	m	o		18	66	159	m		
5/5a/3	103	3	16	210	290	Medium			14	320	420	Med.	O		7	160	220	H	T		8			B	T		13	80	150	m	o		19	71	173	m		
5/5a/4	104	1	15	120	210	Medium			15	460	490	High	H		11	140	220	M	T		11			M	T		15	60	110	m	h		18	64	144	m		
5/5b/3	106	2	16	190	340	Medium			15	470	615	High	O		15	120	300	B	T		10			B	T		17	90	260	m	h		21	51	210	m		
17/1a/1	106	9	16	180	290	Medium			15	485	625	High	H		10	200	280	H	O		11			M	T		16	100	200	m	o		17	75	163	m		
17/1a/2	106	9	16	150	260	Medium			15	455	515	High	H		8	100	220	H	T		8			H	T		14	100	220	m	o		19	71	171	b/m		
17/1a/4	111	8	18	140	230	Medium			17	500	590	Med.	H		18	100	200	D	T		13			D	T		17	120	220	h	o		20	68	167	m		
17/1b/1	128	7	22	200	290	Medium			20		685	Med.	H		21	200	300	M	T								24	60	150	m	o		26	74	138	m	b+	
17/1b/2	132	7	24	170	240	Medium			21	460	500	Med.	H		14	260	300	M	T		9			B	T		24	50	130	h	o		27	87	133	m		
6/1a/3	110	1	19	170	270	Medium			17	385	470	Bad	O		13	260	400	H	T		11			M	T		18	80	180	m	o		24	48	164	m	b-	
6/1a/4	112	2	20	180	290	Medium			17	335	420	Bad	H		10	140	240	B	T		7			B	T		19	100	200	m	h		23	64	214	m	b-	
6/1b/1	116	3	20	140	270	Medium			18	510	590	Bad	H		10	120	260	B	T		12			B	T		21	60	200	m	h		27	79	215	m	b-	
6/1b/4	118	2	21	190	290	Medium			18	400	465	Bad	H		13	200	240	M	T		5			D	T		19	120	210	m	h		21	98	183	b/m	b-	
6/2b/1	134	3	26	130	390	Medium			24	435	640	High	H		19	120	360	B	T		11			B	T		24	70	230	m	o		31	70	238	b/m		
6/2b/2	135	3	28	150	310	Medium			24	310	480	Bad								Unreadable	9			B	O		21	90	280	m	h		26	54	230	b		edge not u
6/2b/3	140	1	29	210	420	Medium			25	325	500	Bad								Unreadable							22	60	150	m	h		24	70	232	b/m		

Table 15 - *L. piscatorius* - Northern Collection - 1st Reading. Age attributed by reader and difference to the modal age.

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	R1 age-mode	R2 Age	R2 age-mode	R3 Age	R3 age-mode	R4 Age	R4 age-mode	R5 Age	R5 age-mode	R6 Age	R6 age-mode	R7 Age	R7 age-mode	R8 Age	R8 age-mode
288	4a/4	288-4a/4	24	10-Abr	2	3	2	3	1	2	0	2	0	1	-1	2	0	2	0	2	0	3	1
209	4b/3	209-4b/3	25	22-Jan	2	2	2	3	1	2	0	1	-1	2	0	2	0	2	0	3	1	2	0
288	4a/5	288-4a/5	26	10-Abr	3	3	3	3	0	2	-1	3	0	1	-2	2	-1	3	0	3	0	3	0
357	4b/4	357-4b/4	28	1-Dez	4	6	3	3	0	3	0	0	-3	1	-2	15	12	2	-1	2	-1	3	0
334	1a/3	334-1a/3	31	10-Nov	2	3	3	3	0	3	0	1	-2	1	-2	3	0	2	-1	2	-1	3	0
217	2a/6	217-2a/6	31	25-Jan	3	4	4	4	0	3	-1	2	-2	3	-1	4	0	3	-1	3	-1	3	-1
266	2b/6	266-2b/6	32	6-Mar	4	4	3	4	1	3	0	3	0	5	2	3	0	3	0	4	1	5	2
345	2b/3	345-2b/3	33	3-Nov	3	4	4	4	0	4	0	1	-3	3	-1	4	0	3	-1	3	-1	5	1
216	1b/2	216-1b/2	34	25-Jan	4	4	4	4	0	3	-1	2	-2	5	1	4	0	3	-1	4	0	5	1
345	2b/5	345-2b/5	35	3-Nov	4	4	4	4	0	4	0	1	-3	4	0	4	0	3	-1	4	0	5	1
345	2b/7	345-2b/7	36	3-Nov	4	4	4	4	0	4	0	2	-2	3	-1	4	0	3	-1	4	0	5	1
207	2a/3	207-2a/3	37	22-Jan	4	5	4	5	1	3	-1	2	-2	3	-1	4	0	4	0	4	0	5	1
294	5a/3	294-5a/3	38	10-Abr	4	5	4	5	1	4	0	4	0	4	0	4	0	4	0	4	0	5	1
346	3a/7	346-3a/7	38	3-Nov	4	5	4	4	0	4	0	5	1	2	-2		-4	4	0	4	0	6	2
346	3a/9	346-3a/9	39	3-Nov	4	4	4	4	0	4	0	3	-1	3	-1	4	0	3	-1	4	0	6	2
346	3b/4	346-3b/4	40	3-Nov	4	4	3	5	2	4	1	3	0	5	2	3	0	3	0	4	1	6	3
286	2a/1	286-2a/1	40	23-Mar	5	5	4	6	2	4	0	4	0	8	4	4	0	4	0	5	1	6	2
347	4a/2	347-4a/2	41	3-Nov	4	5	5	5	0	4	-1	3	-2	3	-2	5	0	4	-1	5	0	5	0
207	2b/5	207-2b/5	42	22-Jan	6	6	5	6	1	4	-1	4	-1	9	4	5	0	5	0	5	0	7	2
209	4b/2	209-4b/2	43	22-Jan	6	6	5	6	1	4	-1	3	-2	11	6	5	0	5	0	5	0	8	3
347	4b/3	347-4b/3	43	3-Nov	5	5	5	5	0	5	0	3	-2	6	1	5	0	4	-1	4	-1	6	1
347	4b/8	347-4b/8	44	3-Nov	4	5	5	5	0	5	0	3	-2	2	-3	5	0	4	-1	4	-1	6	1
293	4b/5	293-4b/5	46	10-Abr	5	5	-	6		5		4		5		5		4		5		5	
340	3b/5	240-3b/5	48	15-Fev	6	6	5	6	1	5	0	6	1	7	2	5	0	5	0	5	0	6	1
225	5a/4	225-5a/4	48	27-Jan	6	6	6	6	0	5	-1	6	0	7	1	6	0	5	-1	5	-1	6	0
348	5a/6	348-5a/6	48	3-Nov	5	6	6	6	0	5	-1	4	-2	3	-3	6	0	5	-1	5	-1	7	1
348	5a/9	348-5a/9	48	3-Nov	6	7	6	6	0	5	-1	5	-1	4	-2		-6	6	0	7	1	8	2
348	5a/7	348-5a/7	48	3-Nov	5	6	-	6		6		4		5				5		5		6	
340	2a/2	340-2a/2	49	13-Out	6	6	6	6	0	5	-1	5	-1	6	0	6	0	5	-1	6	0	6	0
348	5b/2	348-5b/2	50	3-Nov	6	6	6	6	0	5	-1	4	-2	6	0	6	0	6	0	6	0	6	0
309	5b/4	309-5b/4	51	14-Abr	6	7	6	7	1	5	-1	5	-1	5	-1	6	0	6	0	6	0	7	1
309	5b/3	309-5b/3	51	14-Abr	6	6	-	7		5		5		6		6		5		6		7	
211	1b/1	211-1b/1	58	23-Jan	6	7	-	8		6		4		5				6		5		8	
217	2a/2	217-2a/2	59	25-Jan	7	9	-	8		6		5		5		9		7		7		10	
217	2a/1	217-2a/1	62	25-Jan	8	8	8	8	0	7	-1	6	-2	7	-1	8	0	8	0	7	-1	9	1
217	2b/2	217-2b/2	62	25-Jan	8	8	8	8	0	7	-1	7	-1	8	0	8	0	8	0	6	-2	9	1
349	1b/8	349-1b/8	62	3-Nov	8	9	-	8		7		9		5		9		7				10	
350	2a/1	350-2a/1	63	3-Nov	7	8	8	8	0	7	-1	5	-3	5	-3	8	0	7	-1	7	-1	10	2
209	4b/4	209-4b/4	65	23-Jan	9	10	-	11		7		8		11		9		8		7		10	
338	5a/3	338-5a/3	67	10-Nov	7	8	8	8	0	8	0	3	-5	4	-4	8	0	7	-1	8	0	10	2
265	1b/6	265-1b/6	70	3-Mar	9	9	-	9		9		7		8		10		8		9		10	
352	4a/2	352-4a/2	71	17-Nov	10	10	10	10	0	8	-2	11	1	9	-1	10	0	9	-1	10	0	11	1
211	1a/5	211-1a/5	72	23-Jan	9	10	9	9	0	8	-1	8	-1	8	-1	9	0	9	0	9	0	12	3
313	1a/2	315-1a/2	74	16-Mai	8	9	-	10		8		7		6		9				7		9	
339	1b/4	339-1b/4	74	13-Out	8	9	-	9		9		7		8				7		9		10	
334	1a/2	354-1a/2	75	24-Nov	9	11	10	10	0	9	-1	4	-6	7	-3	10	0	10	0	9	-1	12	2
240	3a/1	240-3a/1	76	13-Fev	9	11	10	10	0	9	-1	7	-3	7	-3	11	1	10	0	8	-2	12	2
288	4a/1	288-4a/1	79	10-Abr	9	11	10	10	0	9	-1	4	-6	4	-6	9	-1	10	0	9	-1	13	3
334	1a/3	354-1a/3	79	24-Nov	10	11	11	11	0	10	-1	7	-4	7	-4	11	0	11	0	9	-2	11	0
340	2b/4	340-2b/4	79	13-Out	7	8	-	10		5		5		5				7		7		8	
214	4a/6	214-4a/6	82	24-Jan	10	11	10	11	1	10	0	6	-4	10	0	10	0	10	0	8	-2	14	4
338	5b/1	338-5b/1	82	10-Nov	10	12	-	10		11		7		7		12		11		9		14	
351	3a/1	351-3a/1	84	3-Nov	9	10	-			11		7		7		9		10		9		10	
302	3a/6	302-3a/6	85	14-Abr	9	11	11	11	0	10	-1	6	-5	5	-6	11	0	8	-3	9	-2	13	2
266	2a/1	266-2a/1	86	3-Mar	11	11	11	12	1	10	-1	9	-2	10	-1	11	0	11	0	11	0	10	-1
339	1a/2	339-1a/2	87	13-Out	9	10	-	11		13		5		5		10		9		10		11	
287	3b/1	287-3b/1	91	10-Abr	10	13	12	12	0	11	-1	5	-7	5	-7	12	0	11	-1	11	-1	16	4
351	3b/1	351-3b/1	91	17-Nov	12	13	-	12		14		6				13		14		12		12	
351	3b/2	351-3b/2	91	17-Nov	11	12	-	13		14		5		10				11		9		12	
357	4a/1	357-4a/1	91	1-Dez	12	14	-			14		13		1		15		14		13		13	
351	3a/3	351-3a/3	92	3-Nov	15	14	-	13		16		18		14				15		13		13	
213	3b/5	213-3b/5	93	24-Jan	12	13	-	13		11		8		14				11		10		14	
356	3a/5	356-3a/5	96	1-Dez	13	14	-	13		17		11		7		14		15		12		15	
209	4b/5	209-4b/5	97	23-Jan	12	14	13	14	1	11	-2	7	-6	8	-5	13	0	13	0	12	-1	15	2
356	3a/4	356-3a/4	100	1-Dez	12	14	-	14		17		6		6		13		15		11		14	
351	3a/5	351-3a/5	103	3-Nov	13	15	-	17		19		7		9		12		15		13		15	
207	2b/3	207-2b/3	109	22-Jan	14	17	-	15		14		8		10		19		14		12		19	
357	4a/6	357-4a/6	112	1-Dez	16	19	19	19	0	21	2	9	-10	9	-9	19	0	17	-2	12	-7	20	1
351	3b/6	351-3b/6	114	17-Nov	14	16	-	18		20		7		7		15		14		11		16	
238	1a/3	238-1a/3	118	13-Fev	13	17	-	17		13		6		6		16		14		11		20	
351	3a/6	351-3a/6	124	3-Nov	15	17	-	22		22		7		5		15		17		14		15	
272	3b/4	272-3b/4	128	21-Mar	18	20	-	24		22		11		11		21		16		18		20	
286	2b/2	286-2b/2	136	10-Abr	21	24	-	28		25		13		9		22		20		22		25	

Table 16 – *L. piscatorius* - Northern collection - 1st reading.
By modal age are presented the average age recorded, 2*stdev and number of age readings by reader and of all readers.

READER 1

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	3.00	3.60	4.40	5.50	6.17	-	8.00	9.00	10.20	11.33	12.00	14.00	-	-	-	-	-	19.00	20.00
2*stdev	-	-	0.00	1.79	1.40	1.10	0.82	-	0.00		0.89	1.15			-	-	-	-	-		0.00
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 2

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.00	3.00	3.70	4.50	5.00	-	7.25	8.00	9.00	10.00	11.00	11.00	-	-	-	-	-	20.00	20.00
2*stdev	-	-	0.00	1.41	0.97	1.10	0.00	-	1.00		1.41	0.00			-	-	-	-	-		0.00
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 3

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	1.50	2.00	2.60	3.67	5.00	-	5.25	8.00	6.80	7.33	5.00	7.00	-	-	-	-	-	9.00	12.00
2*stdev	-	-	1.41	2.83	2.70	2.42	1.26	0.00	3.42		5.18	3.06			-	-	-	-	-		2.83
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 4

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	1.50	2.60	3.80	6.33	4.83	-	6.00	8.00	7.40	7.33	5.00	8.00	-	-	-	-	-	10.00	10.00
2*stdev	-	-	1.41	4.38	3.37	6.89	2.94	0.00	3.65		4.60	5.03			-	-	-	-	-		2.83
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 5

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.00	2.80	3.60	5.00	5.00	-	8.00	9.00	10.00	11.00	12.00	13.00	-	-	-	-	-	19.00	20.00
2*stdev	-	-	0.00	0.89	2.53	0.00	4.90	0.00	0.00		1.41	0.00			-	-	-	-	-		0.00
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 6

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.00	2.60	3.40	4.50	5.50	-	7.50	9.00	9.80	10.00	11.00	13.00	-	-	-	-	-	17.00	18.00
2*stdev	-	-	0.00	1.10	1.03	1.10	1.10	0.00	1.15		0.89	3.46			-	-	-	-	-		5.66
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 7

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.50	3.00	3.90	4.67	5.83	-	7.00	9.00	8.80	9.67	11.00	12.00	-	-	-	-	-	12.00	19.00
2*stdev	-	-	1.41	2.00	1.14	1.03	1.51	0.00	1.63		1.67	2.31			-	-	-	-	-		2.83
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

READER 8

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.50	4.00	5.00	6.33	6.67	-	9.50	12.00	12.40	11.33	16.00	15.00	-	-	-	-	-	20.00	20.00
2*stdev	-	-	1.41	2.83	1.89	2.07	1.63	0.00	1.15		2.28	3.06			-	-	-	-	-		0.00
n	0	0	2	5	10	6	6	0	4	1	5	3	1	1	0	0	0	0	0	1	2

ALL READERS

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.13	2.95	3.80	5.06	5.50	-	7.31	9.00	9.30	9.75	10.38	11.63	-	-	-	-	-	15.75	17.38
2*stdev	-	-	1.24	2.48	2.37	3.13	2.44	-	3.02	2.62	4.16	3.88	7.40	5.65	-	-	-	-	-	9.30	8.03
n	0	0	16	40	80	48	48	0	32	8	40	24	8	8	0	0	0	0	0	8	16

Table 17 - *L. piscatorius* - Northern collection - 1st reading. Average Percentage Error (APE), Coefficient of Variation (CV) and Index of Precision (D) estimated for all readers and for readers with experience (%).

		APE	CV	D	n
1st reading	All readers	18.7	24.6	8.8	73
	R1, R5 and R6	8.9	12.0	7.2	73
	R1, R2, R5, R6, R7 and R8	11.6	15.3	6.3	73
	All readers (1 semester)	17.4	22.9	8.1	36
	All readers (2 semester)	19.9	26.2	9.4	37
2nd reading	All readers	15.8	21.3	7.5	35
	R1, R5 and R6	10.0	13.4	7.8	35
	R1, R2, R5, R6, R7 and R8	10.5	13.9	5.7	35

Table 18 – *L. piscatorius* 1st reading credibility level percentages by reader for the Northern and Southern Collections.

	R1 - Iñaki Quincoces		R2 - Asier Zamakona		R3 - Helen McCormick		R4 - Fiona Woods		R5 - Jorge Landa		R6 - Hervé Dupouy		R7 - Bernard Kergoat		R8 - Rafael Duarte	
Northern Collection	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%
High	5	6.8	28	38.4	15	20.5	17	23.3	21	28.8	6	8.2	3	4.1	1	1.4
Medium	53	72.6	44	60.3	36	49.3	17	23.3	36	49.3	36	49.3	19	26.0	54	74.0
Low	13	17.8	1	1.4	20	27.4	38	52.1	7	9.6	31	42.5	50	68.5	18	24.7
Unred.	2	2.7		0.0	2	2.7	1	1.4	9	12.3		0.0	1	1.4		0.0
Total	73		73		73		73		73		73		73		73	
Southern Collection	Nº	%	Nº	%	Nº	%	Nº	%	Nº	%					Nº	%
High	6	8.1	20	27.0	26	35.1	14	18.9	23	31.1					4	5.4
Medium	66	89.2	47	63.5	25	33.8	31	41.9	51	68.9					55	74.3
Low	2	2.7	7	9.5	18	24.3	27	36.5		0.0					15	20.3
Unred.		0.0		0.0	5	6.8	2	2.7		0.0						0.0
Total	74		74		74		74		74						74	

Table 19 - *L. piscatorius* - Southern Collection - 1st Reading. Age attributed by reader and difference to the modal age.

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	R1 age-mode	R2 Age	R2 age-mode	R3 Age	R3 age-mode	R4 Age	R4 age-mode	R5 Age	R5 age-mode	R8 Age	R8 age-mode
14	3b/1	14/3b/1	19	15-Set	1	2	-	2		2		0		1		1		1	
14	3b/2	14/3b/2	19	15-Set	1	2	-	2		2		0		1		1		1	
6	3b/2	6/3b/2	23	15-Abr	2	3	3	3	0	2	-1	1	-2	2	-1	3	0	3	0
6	3b/1	6/3b/1	23	15-Abr	2	3	-	3		2		1		2		2		3	
12	1a/1	12/1a/1	25	15-Set	3	3	3	3	0	3	0	1	-2	2	-1	3	0	3	0
6	3b/4	6/3b/4	26	15-Abr	2	3	3	3	0	3	0	1	-2	2	-1	2	-1	3	0
14	3b/3	14/3b/3	31	15-Ago	3	4	3	4	1	3	0	1	-2	3	0	3	0	3	0
14	3b/5	14/3b/5	33	15-Jul	3	4	-	4		4		2		3		3		3	
3	2a/1	3/2a/1	34	15-Mar	4	4	4	4	0	4	0			3	-1	4	0	4	0
13	1a/3	13/1a/3	37	15-Set	3	4	4	4	0	4	0	1	-3	3	-1	3	-1	3	-1
13	1a/4	13/1a/4	39	15-Jul	4	5	-	5		4		2		4		5		4	
12	1a/2	12/1a/2	40	15-Set	4	5	4	5	1	4	0	2	-2	4	0	4	0	4	0
12	1a/3	12/1a/3	42	15-Jul	4	5	4	5	1	4	0	2	-2	5	1	4	0	4	0
13	1b/1	13/1b/1	43	15-Set	5	5	5	5	0	5	0	1	-4	6	1	5	0	5	0
13	1b/2	13/1b/2	44	15-Jul	5	5	5	5	0	5	0	4	-1	5	0	5	0	5	0
13	1b/4	13/1b/4	45	15-Set	5	5	5	5	0	5	0	3	-2	7	2	5	0	5	0
13	1b/5	13/1b/5	46	15-Ago	5	6	5	5	0	5	0	3	-2	6	1	6	1	5	0
9	1a/1	9/1a/1	50	15-Mai	5	6	6	6	0	5	-1	3	-3	4	-2	6	0	6	0
9	1a/3	9/1a/3	52	15-Abr	6	6	6	6	0	6	0	5	-1	6	0	6	0	7	1
9	1a/4	9/1a/4	53	15-Mai	7	7	7	7	0	6	-1	6	-1	7	0	7	0	7	0
9	1a/5	9/1a/5	54	15-Jun	7	7	-	7		6		5		8		6		7	
15	2b/1	15/2b/1	55	15-Jul	6	7	7	7	0	6	-1	4	-3	5	-2	7	0	7	0
13	2b/1	13/2b/1	55	15-Ago	7	7	7	7	0	6	-1	8	1	7	0	7	0	8	1
15	2b/4	15/2b/4	56	15-Set	7	7	7	7	0	6	-1	7	0	6	-1	7	0	7	0
13	2b/5	13/2b/5	60	15-Jul	7	7	7	7	0	7	0	6	-1	8	1	7	0	8	1
3	5a/4	3/5a/4	61	15-Fev	8	7	6	8	2	7	1	11	5	9	3	6	0	6	0
7	4a/1	7/4a/1	63	15-Mai	7	8	8	8	0	7	-1	6	-2	6	-2	8	0	8	0
3	5b/3	3/5b/3	64	15-Fev	8	8	8	8	0	7	-1	10	2	9	1	8	0	8	0
7	4a/4	7/4a/4	65	15-Jun	7	9	8	8	0	7	-1	6	-2	6	-2	9	1	8	0
7	4b/2	7/4b/2	67	15-Mai	7	8	8	8	0	8	0	5	-3	7	-1	7	-1	8	0
7	4b/4	7/4b/4	68	15-Mai	8	9	-	9		8		7		6		8		9	
12	3a/1	12/3a/1	71	15-Set	9	9	9	9	0	8	-1	7	-2	9	0	9	0	9	0
15	5b/1	15/5b/1	72	15-Ago	9	10	-	10		9		5		11		10		9	
12	3a/3	12/3a/3	73	15-Set	9	9	9	9	0	9	0	7	-2	9	0	9	0	10	1
15	5b/2	15/5b/2	73	15-Set	9	10	9	9	0	9	0	4	-5	9	0	10	1	11	2
15	5b/4	15/5b/4	74	15-Ago	9	9	9	9	0	9	0	4	-5	10	1	9	0	14	5
2	3a/1	2/3a/1	75	15-Fev	10	11	-	10		9		9		5		11		13	
2	3a/2	2/3a/2	76	15-Fev	10	11	10	10	0	9	-1	9	-1	9	-1	11	1	10	0
2	3a/3	2/3a/3	77	15-Fev	11	12	10	10	0	10	0	10	0	7	-3	14	4	13	3
2	3a/4	2/3a/4	77	15-Fev	10	11	10	10	0	10	0	7	-3	8	-2	11	1	13	3
2	3b/1	2/3b/1	79	15-Fev	9	11	-	10		10		6		7		11		11	
2	3b/2	2/3b/2	79	15-Mar	9	11	10	10	0	10	0	5	-5	3	-7	12	2	13	3
2	3b/4	2/3b/4	81	15-Mar	11	12	10	10	0	10	0	10	0	9	-1	14	4	11	1
2	3b/5	2/3b/5	81	15-Mar	10	12	-	11		10		8		6		13		12	
13	4b/2	13/4b/2	84	15-Set	11	12	11	11	0	11	0	8	-3	8	-3	12	1	14	3
13	4b/3	13/4b/3	85	15-Set	10	11	11	11	0	11	0	7	-4	7	-4	11	0	13	2
13	4b/5	13/4b/5	86	15-Set	11	12	11	11	0	11	0	9	-2	8	-3	12	1	13	2
5	3a/1	5/3a/1	89	15-Fev	12	13	12	12	0	12	0	10	-2	7	-5	13	1	15	3
5	3a/3	5/3a/3	90	15-Mar	11	12	12	12	0	12	0	8	-4	8	-4	11	-1	15	3
5	3a/4	5/3a/4	91	15-Fev	12	13	12	12	0	12	0	9	-3	10	-2	13	1	15	3
10	2b/1	10/2b/1	93	15-Mai	13	13	13	12	-1	13	0	9	-4	10	-3	13	0	18	5
13	5b/2	13/5b/2	94	15-Set	12	13	13	12	-1	13	0	10	-3	10	-3	13	0	15	2
13	5b/3	13/5b/3	94	15-Set	11	12	13	13	0	13	0	7	-6	7	-6	11	-2	14	1
10	2b/4	10/2b/4	94	15-Jun	13	13	13	13	0	13	0	8	-5	11	-2	12	-1	20	7
16	4b/1	16/4b/1	98	15-Set	13	13	13	13	0	14	1	11	-2	10	-3	13	0	17	4
16	4b/2	16/4b/2	98	15-Set	14	14	14	14	0	14	0	13	-1	9	-5	14	0	20	6
16	4b/3	16/4b/3	99	15-Set	13	13	14	14	0	14	0	11	-3	9	-5	12	-2	20	6
16	4b/4	16/4b/4	100	15-Set	12	13	14	14	0	14	0	7	-7	9	-5	12	-2	15	1
5	5a/2	5/5a/2	103	15-Mar	14	15	15	15	0	14	-1	13	-2	9	-6	15	0	18	3
5	5a/3	5/5a/3	103	15-Mar	13	15	-	16		14		7		8		13		19	
5	5a/4	5/5a/4	104	15-Jan	14	15	15	15	0	15	0	11	-4	11	-4	15	0	18	3
17	1a/1	17/1a/1	106	15-Set	14	16	16	16	0	15	-1	10	-6	11	-5	16	0	17	1
5	5b/3	5/5b/3	106	15-Fev	16	17	-	16		15		15		10		17		21	
17	1a/2	17/1a/2	106	15-Set	13	15	-	16		17		8		8		14		19	
6	1a/3	6/1a/3	110	15-Jan	17	19	-	19		17		13		11		18		24	
17	1a/4	17/1a/4	111	15-Ago	17	18	17	18	1	17	0	18	1	13	-4	17	0	20	3
6	1a/4	6/1a/4	112	15-Fev	16	20	-	20		17		10		7		19		23	
6	1b/1	6/1b/1	116	15-Mar	18	21	-	20		18		10		12		21		27	
6	1b/4	6/1b/4	118	15-Fev	16	20	21	21	0	18	-3	13	-8	5	-16	19	-2	21	0
17	1b/1	17/1b/1	128	15-Jul	23	23	-	22		20		21				24		26	
17	1b/2	17/1b/2	132	15-Jul	20	24	24	24	0	21	-3	14	-10	9	-15	24	0	27	3
6	2b/1	6/2b/1	134	15-Mar	23	25	24	26	2	24	0	19	-5	11	-13	24	0	31	7
6	2b/2	6/2b/2	135	15-Mar	22	25	-	28		24				9		21		26	
6	2b/3	6/2b/3	140	15-Jan	25	26	-	29		25						22		24	

Table 20 – *L. piscatorius* - Southern collection - 1st reading

By modal age are presented the average age recorded, 2*stdev and number of age readings by reader and of all readers.

READER 1

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.25	4.67	5.00	6.67	7.00	8.00	9.00	10.00	11.00	12.00	12.60	14.00	15.00	16.00	18.00	-	-	-
2*stdev	-	-	-	1.00	-	0.00	2.31	0.00	0.00	0.00	-	-	0.00	-	-	0.00	-	-	-	-	-
n	0	0	0	4	3	4	3	5	4	4	5	3	3	5	3	2	1	1	0	0	0

READER 2

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	2.75	4.00	5.00	6.00	6.20	7.25	8.75	9.80	11.00	12.00	13.20	14.00	14.50	15.00	17.00	-	-	-
2*stdev	-	-	-	1.00	-	0.00	2.00	0.89	1.00	1.00	-	-	0.00	-	-	1.41	-	-	-	-	-
n	0	0	0	4	3	4	3	5	4	4	5	3	3	5	3	2	1	1	0	0	0

READER 3

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	1.00	1.33	2.75	6.33	6.20	6.75	5.50	8.20	8.00	9.00	9.00	10.33	12.00	10.00	18.00	-	-	-
2*stdev	-	-	-	0.00	-	2.52	8.33	0.00	4.43	3.46	-	-	2.00	-	-	2.83	-	-	-	-	-
n	0	0	0	4	3	4	3	5	4	4	5	3	3	5	3	2	1	1	0	0	0

READER 4

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	2.25	4.00	6.00	6.33	6.60	7.00	9.25	7.20	7.67	8.33	9.60	9.00	10.00	11.00	13.00	-	-	-
2*stdev	-	-	-	1.00	-	1.63	5.03	0.00	2.83	1.00	-	-	3.06	-	-	2.83	-	-	-	-	-
n	0	0	0	4	3	4	3	5	4	4	5	3	3	5	3	2	1	1	0	0	0

READER 5

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	2.75	4.00	5.25	6.00	7.00	8.00	9.25	12.40	11.67	12.33	12.40	12.67	15.00	16.00	17.00	-	-	-
2*stdev	-	-	-	1.00	-	1.00	0.00	0.00	1.63	1.00	-	-	2.31	-	-	0.00	-	-	-	-	-
n	0	0	0	4	3	4	3	5	4	4	5	3	3	5	3	2	1	1	0	0	0

READER 8

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.00	4.00	5.00	6.33	7.40	8.00	11.00	12.00	13.33	15.00	16.80	18.33	18.00	17.00	20.00	-	-	-
2*stdev	-	-	-	0.00	-	0.00	1.15	0.00	0.00	4.32	-	-	0.00	-	-	0.00	-	-	-	-	-
n	0	0	0	4	3	4	3	5	4	4	5	3	3	5	3	2	1	1	0	0	0

ALL READERS

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	1.88	2.75	3.63	4.71	5.05	5.63	6.59	7.45	7.83	8.58	9.20	9.79	10.56	10.63	12.88	-	-	-
2*stdev	-	-	-	2.63	3.88	4.70	6.34	6.09	6.89	8.45	9.64	9.93	10.94	11.86	12.96	13.43	14.02	16.37	-	-	-
n	0	0	0	32	24	32	24	40	32	32	40	24	24	40	24	16	8	8	0	0	0

Table 21 - *L. piscatorius* - Southern collection - 1st reading. Average Percentage Error (APE), Coefficient of Variation (CV) and Index of Precision (D) estimated for all readers and for readers with experience (%).

	APE	CV	D	n
All readers	17.8	24.5	10.1	74
R1and R5	5.7	8.1	5.7	74
R1,R2,R5 and R8	9.1	12.0	6.0	74
All readers (1 semester)	17.9	23.8	9.8	38
All readers (2 semester)	17.8	25.3	10.3	36

Table 22 - *L. piscatorius* - Northern collection - 2nd reading. Total results obtained by reader.

Sample	Order	Numb.	Length (mm)	Date	R1 Age	R2 Age	R3 Age	R4 Age	R5 Age	R6 Age	R7 Age	R8 Age	Modal age (experts)
207	2a/5	207-2a/5	377	22-Jan	4	4	5	7	4	4	4	3	4
207	2b/3	207-2b/3	1091	22-Jan	22	14	25	21	15	19	18	13	-
209	4b/3	209-4b/3	253	22-Jan	3	3	3	6	3	2	3	3	3
209	4b/4	209-4b/4	652	23-Jan	8	7	10	12	8	9	8	8	8
209	4b/5	209-4b/5	974	23-Jan	17	12	18	13	12	13	12	12	-
211	1b/1	211-1b/1	586	23-Jan	7	6	7	8	6	6	5	5	6
214	4a/6	214-4a/6	826	24-Jan	12	10	15	11	10	15	11	11	-
216	1b/2	216-1b/2	345	25-Jan	4	3	4	6	3	4	4	4	4
217	2a/6	217-2a/6	317	25-Jan	4	3	3	5	3	3	3	3	3
217	2b/2	217-2b/2	628	25-Jan	8	7	9	10	9	8	8	8	8
238	1a/3	238-1a/3	1182	13-Fev	20	15	17	16	13	19	16	13	-
240	3b/5	240-3b/5	480	15-Fev	7	5	8	9	5	7	6	6	7
266	2b/6	266-2b/6	328	6-Mar	4	3	4	6	4	4	5	4	4
272	3b/4	272-3b/4	1285	21-Mar	22	18	27	26	20	18	17	26	-
286	2b/2	286-2b/2	1365	10-Abr	23	21	24	26		27	20	24	-
287	3b/1	287-3b/1	910	10-Abr	16	11	22	17	11	15	14	13	-
288	4a/1	288-4a/1	799	10-Abr	11	9	14	12	10	12	11	12	-
288	4a/4	288-4a/4	246	10-Abr	3	3	3	5	2	3	3	3	3
288	4a/5	288-4a/5	266	10-Abr	3	3	4	5	3	3	3	3	3
293	4b/5	293-4b/5	460	10-Abr	6	5	6	7	5	5	5	6	5
302	3a/6	302-3a/6	855	14-Abr	12	10	13	14	11	13	9	10	-
309	5b/3	309-5b/3	515	14-Abr	7	5	10	6	6	6	6	6	6
338	5a/3	338-5a/3	675	10-Nov	8	7	12	13	8	9	9	8	8
339	1b/4	339-1b/4	745	13-Out	10	8	12	15	8	9	9	9	-
346	3a/9	346-3a/9	395	3-Nov	5	4	9	10	3	4	6	6	-
347	4a/2	347-4a/2	415	3-Nov	5	5	8	7	4	4	6	6	4
347	4b/3	347-4b/3	435	3-Nov	5	4	9	8	5	4	6	6	5
348	5a/9	348-5a/9	485	3-Nov	6	5	10	8	7	6	7	7	6
348	5b/2	348-5b/2	505	3-Nov	6	5	7	7	5	5	6	7	5
351	3a/3	351-3a/3	925	3-Nov	16	12	19	22	12	13	12	13	-
351	3b/2	351-3b/2	910	17-Nov	15	11	18	19	11	15	13	11	15
352	4a/2	352-4a/2	715	17-Nov	10	8	10	10	10	11	10	11	10
356	3a/4	356-3a/4	1000	1-Dez	18	12	23	13	12	18	13	12	18
357	4b/4	357-4b/4	285	1-Dez	3	3	3	4	2	2	3	3	2
357	4a/6	357-4a/6	1125	1-Dez	21	15	25	22	14	21	16	19	21

Table 23 - *L. piscatorius* - Northern collection - 2nd reading. Age attributed by reader and respective difference to the modal age.

Sample	Order	Numb.	Length (mm)	Date	average	aver. (experts)	Mode (expert)	R1 Age	R1 age-mode	R2 Age	R2 age-mode	R3 Age	R3 age-mode	R4 Age	R4 age-mode	R5 Age	R5 age-mode	R6 Age	R6 age-mode	R7 Age	R7 age-mode	R8 Age	R8 age-mode
288	4a/4	288-4a/4	246	10-Abr	3	3	3	3	0	3	0	3	0	5	2	2	-1	3	0	3	0	3	0
209	4b/3	209-4b/3	253	22-Jan	3	3	3	3	0	3	0	3	0	6	3	3	0	2	-1	3	0	3	0
288	4a/5	288-4a/5	266	10-Abr	3	3	3	3	0	3	0	4	1	5	2	3	0	3	0	3	0	3	0
357	4b/4	357-4b/4	285	1-Dez	3	2	2	3	1	3	1	3	1	4	2	2	0	2	0	3	1	3	1
217	2a/6	217-2a/6	317	25-Jan	3	3	3	4	1	3	0	3	0	5	2	3	0	3	0	3	0	3	0
266	2b/6	266-2b/6	328	6-Mar	4	4	4	4	0	3	-1	4	0	6	2	4	0	4	0	5	1	4	0
216	1b/2	216-1b/2	345	25-Jan	4	4	4	4	0	3	-1	4	0	6	2	3	-1	4	0	4	0	4	0
207	2a/5	207-2a/5	377	22-Jan	4	4	4	4	0	4	0	5	1	7	3	4	0	4	0	4	0	3	-1
346	3a/9	346-3a/9	395	3-Nov	6	4	-	5		4		9		10		3		4		6		6	
347	4a/2	347-4a/2	415	3-Nov	6	4	4	5	1	5	1	8	4	7	3	4	0	4	0	6	2	6	2
347	4b/3	347-4b/3	435	3-Nov	6	5	5	5	0	4	-1	9	4	8	3	5	0	4	-1	6	1	6	1
293	4b/5	293-4b/5	460	10-Abr	6	5	5	6	1	5	0	6	1	7	2	5	0	5	0	5	0	6	1
240	3b/5	240-3b/5	480	15-Fev	7	6	7	7	0	5	-2	8	1	9	2	5	-2	7	0	6	-1	6	-1
348	5a/9	348-5a/9	485	3-Nov	7	6	6	6	0	5	-1	10	4	8	2	7	1	6	0	7	1	7	1
348	5b/2	348-5b/2	505	3-Nov	6	5	5	6	1	5	0	7	2	7	2	5	0	5	0	6	1	7	2
309	5b/3	309-5b/3	515	14-Abr	7	6	6	7	1	5	-1	10	4	6	0	6	0	6	0	6	0	6	0
211	1b/1	211-1b/1	586	23-Jan	6	6	6	7	1	6	0	7	1	8	2	6	0	6	0	5	-1	5	-1
217	2b/2	217-2b/2	628	25-Jan	8	8	8	8	0	7	-1	9	1	10	2	9	1	8	0	8	0	8	0
209	4b/4	209-4b/4	652	23-Jan	9	8	8	8	0	7	-1	10	2	12	4	8	0	9	1	8	0	8	0
338	5a/3	338-5a/3	675	10-Nov	9	8	8	8	0	7	-1	12	4	13	5	8	0	9	1	9	1	8	0
352	4a/2	352-4a/2	715	17-Nov	10	10	10	10	0	8	-2	10	0	10	0	10	0	11	1	10	0	11	1
339	1b/4	339-1b/4	745	13-Out	10	9	-	10		8		12		15		8		9		9		9	
288	4a/1	288-4a/1	799	10-Abr	11	11	-	11		9		14		12		10		12		11		12	
214	4a/6	214-4a/6	826	24-Jan	12	12	-	12		10		15		11		10		15		11		11	
302	3a/6	302-3a/6	855	14-Abr	12	12	-	12		10		13		14		11		13		9		10	
351	3b/2	351-3b/2	910	17-Nov	14	14	15	15	0	11	-4	18	3	19	4	11	-4	15	0	13	-2	11	-4
287	3b/1	287-3b/1	910	10-Abr	15	14	-	16		11		22		17		11		15		14		13	
351	3a/3	351-3a/3	925	3-Nov	15	14	-	16		12		19		22		12		13		12		13	
209	4b/5	209-4b/5	974	23-Jan	14	14	-	17		12		18		13		12		13		12		12	
356	3a/4	356-3a/4	1000	1-Dez	15	16	18	18	0	12	-6	23	5	13	-5	12	-6	18	0	13	-5	12	-6
207	2b/3	207-2b/3	1091	22-Jan	18	19	-	22		14		25		21		15		19		18		13	
357	4a/6	357-4a/6	1125	1-Dez	19	19	21	21	0	15	-6	25	4	22	1	14	-7	21	0	16	-5	19	-2
238	1a/3	238-1a/3	1182	13-Fev	16	17	-	20		15		17		16		13		19		16		13	
272	3b/4	272-3b/4	1285	21-Mar	22	20	-	22		18		27		26		20		18		17		26	
286	2b/2	286-2b/2	1365	10-Abr	24	25	-	23		21		24		26				27		20		24	

Table 24 – *L. piscatorius* - Northern collection - 2nd reading.

By modal age are presented the average age recorded, 2*stdev and number of age readings by reader and of all readers.

READER 1

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	3.00	3.25	4.25	5.67	6.67	7.00	8.00	-	10.00	-	-	-	-	15.00	-	-	18.00	-	-
2*stdev	-	-	-	1.00	1.00	1.15	1.15	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 2

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	3.00	3.00	3.75	4.67	5.33	5.00	7.00	-	8.00	-	-	-	-	11.00	-	-	12.00	-	-
2*stdev	-	-	-	0.00	1.91	1.15	1.15	-	0.00	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 3

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	3.00	3.25	5.25	7.33	9.00	8.00	10.33	-	10.00	-	-	-	-	18.00	-	-	23.00	-	-
2*stdev	-	-	-	1.00	3.79	3.06	3.46	0.00	3.06	-	~-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 4

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	4.00	5.25	6.50	7.33	7.33	9.00	11.67	-	10.00	-	-	-	-	19.00	-	-	13.00	-	-
2*stdev	-	-	-	1.00	1.15	1.15	2.31	0.00	3.06	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 5

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.00	2.75	3.75	5.00	6.33	5.00	8.33	-	10.00	-	-	-	-	11.00	-	-	12.00	-	-
2*stdev	-	-	-	1.00	1.00	0.00	1.15	0.00	1.15	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 6

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.00	2.75	4.00	4.67	6.00	7.00	8.67	-	11.00	-	-	-	-	15.00	-	-	18.00	-	-
2*stdev	-	-	-	1.00	0.00	1.15	0.00	0.00	1.15	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 7

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	3.00	3.00	4.75	5.67	6.00	6.00	8.33	-	10.00	-	-	-	-	13.00	-	-	13.00	-	-
2*stdev	-	-	-	0.00	1.91	1.15	2.00	0.00	1.15	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

READER 8

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	3.00	3.00	4.25	6.33	6.00	6.00	8.00	-	11.00	-	-	-	-	11.00	-	-	12.00	-	-
2*stdev	-	-	-	0.00	2.52	1.15	2.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
n	0	0	1	4	4	3	3	1	3	0	1	0	0	0	0	1	0	0	1	0	0

ALL READERS

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.88	3.28	4.56	5.83	6.58	6.63	8.79	-	10.00	-	-	-	-	14.13	-	-	15.13	-	-
2*stdev	-	-	1.28	1.70	2.49	2.41	2.70	2.82	3.17	-	1.85	-	-	-	-	6.36	-	-	8.17	-	-
n	0	0	8	32	32	24	24	8	24	0	8	0	0	0	0	8	0	0	8	0	0
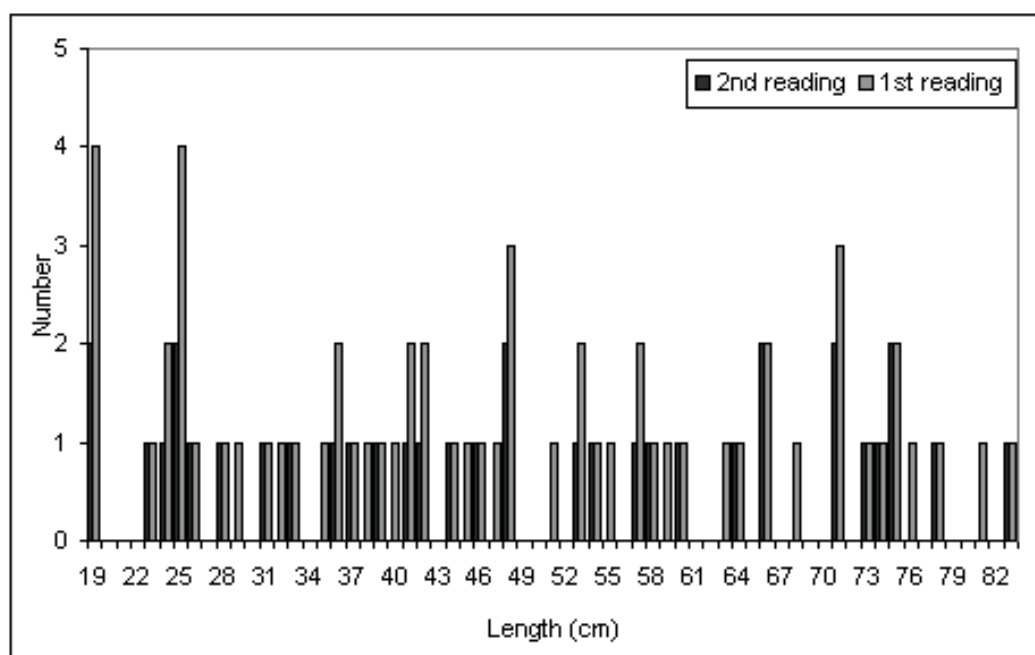
Figure 1a - Length frequency distribution of *L. budegassa* - Northern Collection.
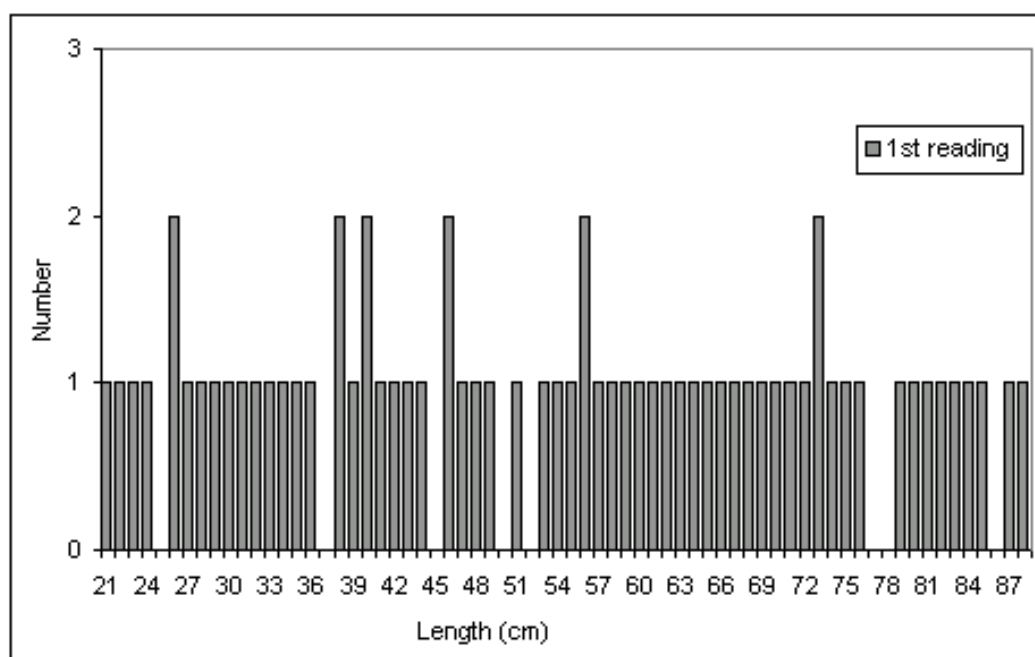
Figure 1b - Length frequency distribution of *L. budegassa* - Southern Collection.
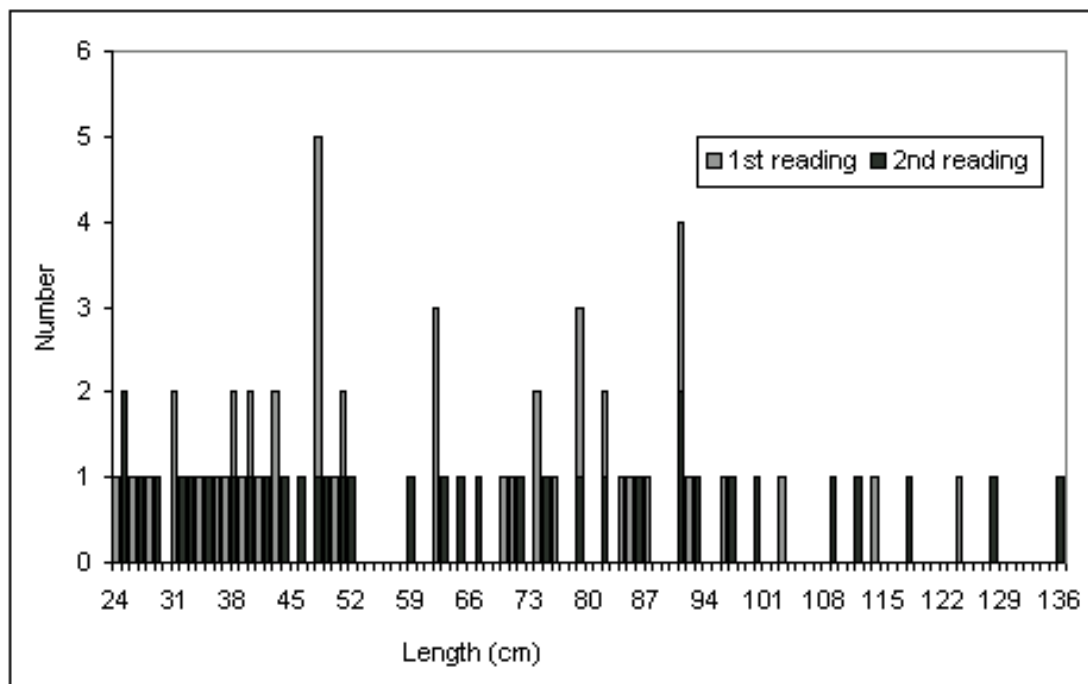
Figure 2a - Length frequency distribution of *L. piscatorius* - Northern Collection.
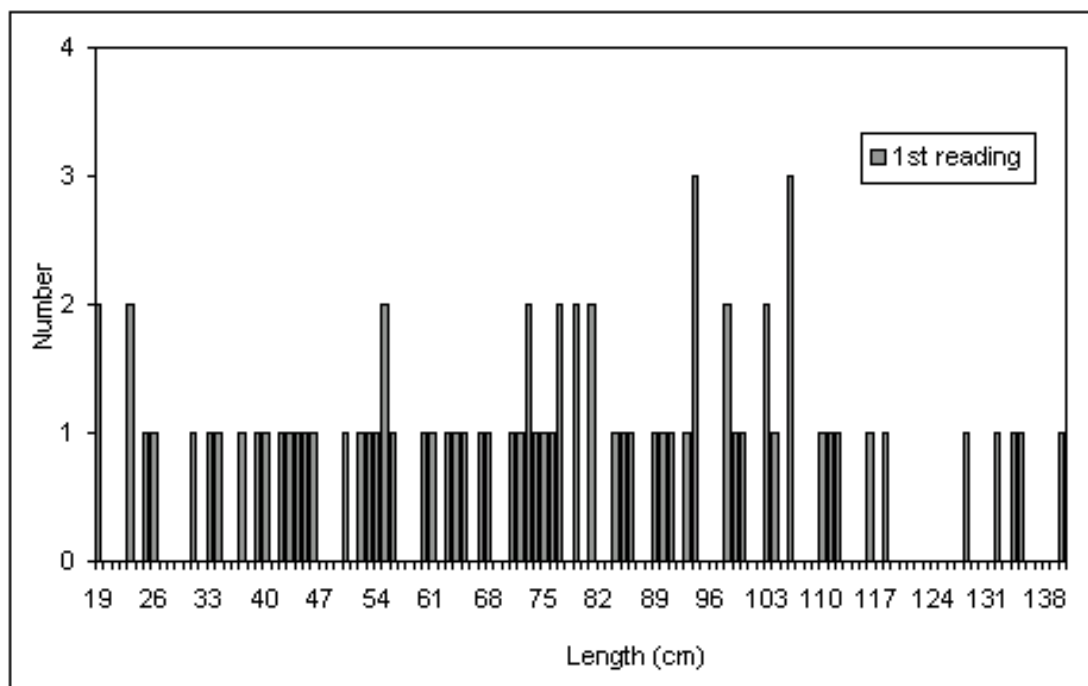
Figure 2b - Length frequency distribution of *L. piscatorius* - Southern Collection.
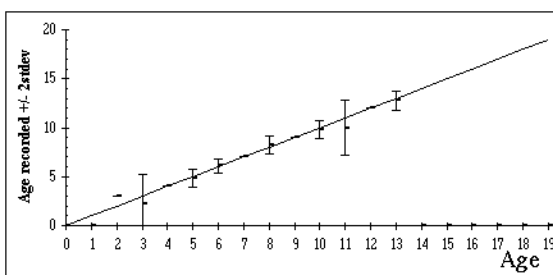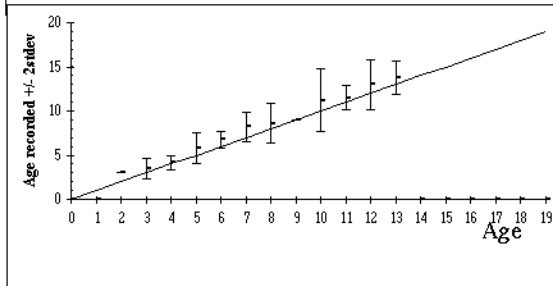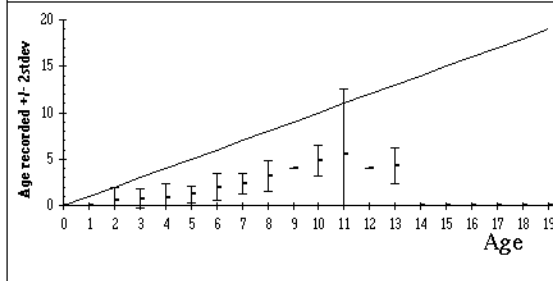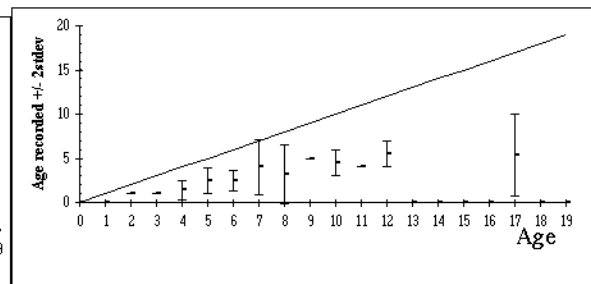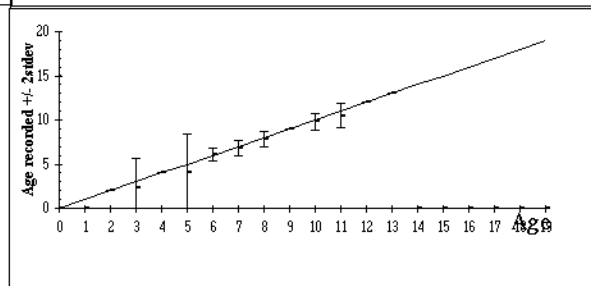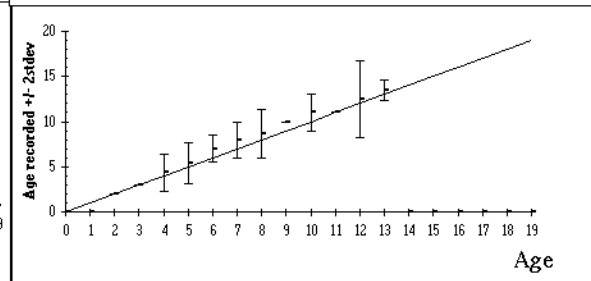
Figure 3a - *L. budegassa* **Northern collection - 1st reading**
In above age bias plots average age +/- 2stdev of each age reader is plotted against modal age.

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	2.00	2.13	3.17	4.11	5.32	6.07	6.60	7.67	8.96	9.18	9.83	11.45	-	-	-	5.33	-	-
2*stdev	-	-	2.00	2.66	3.09	3.97	4.11	4.64	5.29	5.01	5.56	6.05	7.76	7.52	-	-	-	4.62	-	-

Figure 3b - *L. budegassa* **Northern collection - 1st reading**
In above age bias plot average age +/- 2stdev of all age readers is plotted against modal age.
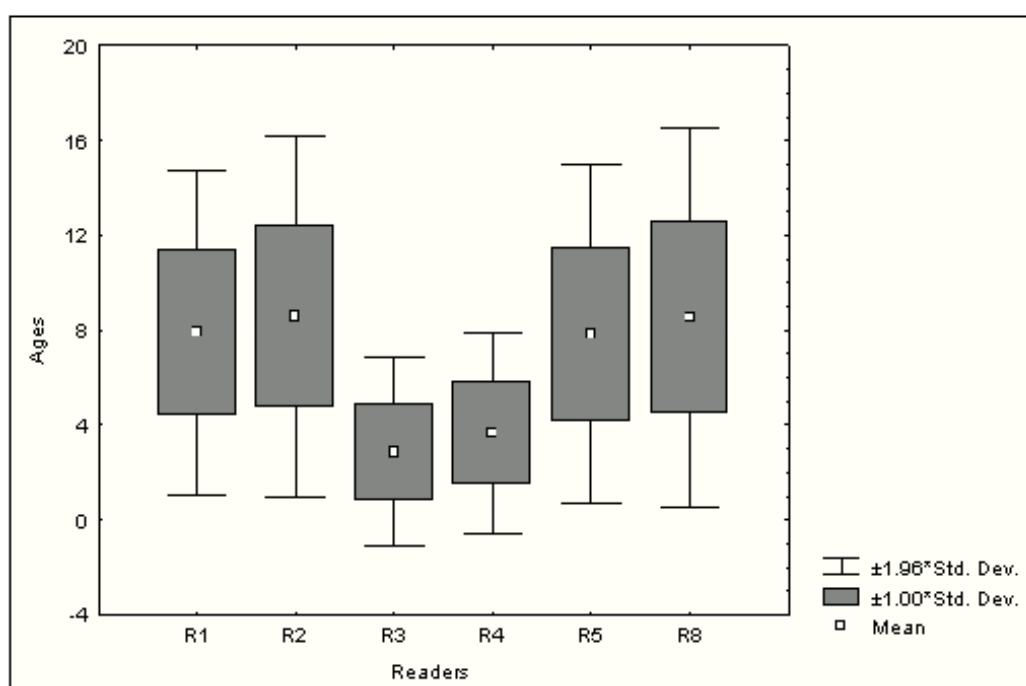
Figure 4 - *L. budegassa* Northern collection - 1st reading
Box-Whisker Plot of mean age, by reader.
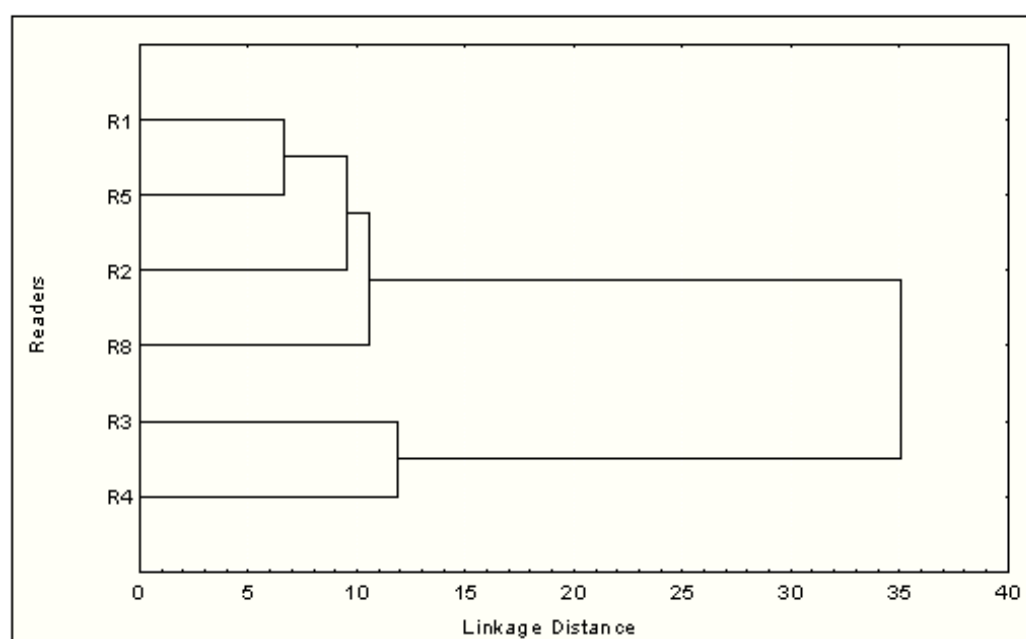
Figure 5 - *L. budegassa* Northern collection - 1st reading
Euclidean distances between readers.
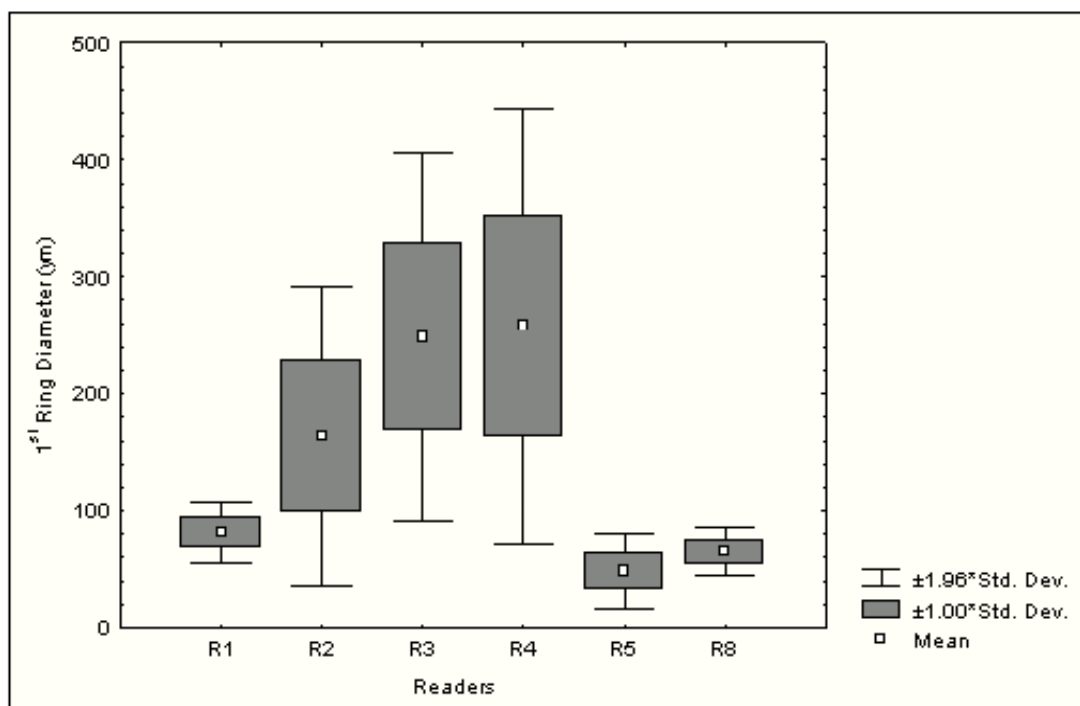
Figure 6 - *L. budegassa* Northern collection - 1st reading
Box-Whisker Plot for the average 1st ring diameter, by reader.
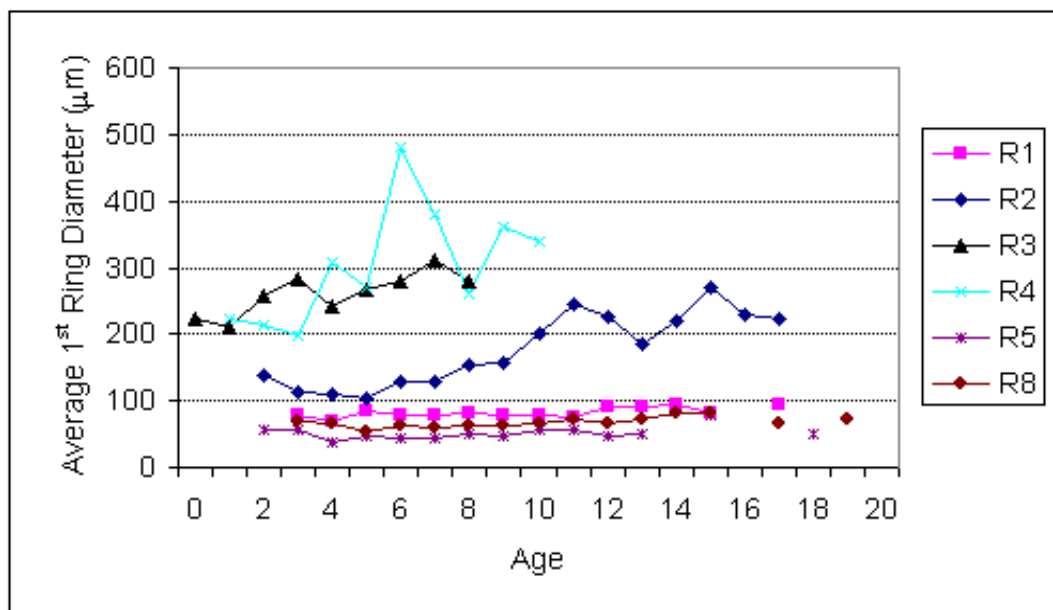
Figure 7 - *L. budegassa* Northern collection - 1st reading
Average 1st ring diameter by age, by reader.
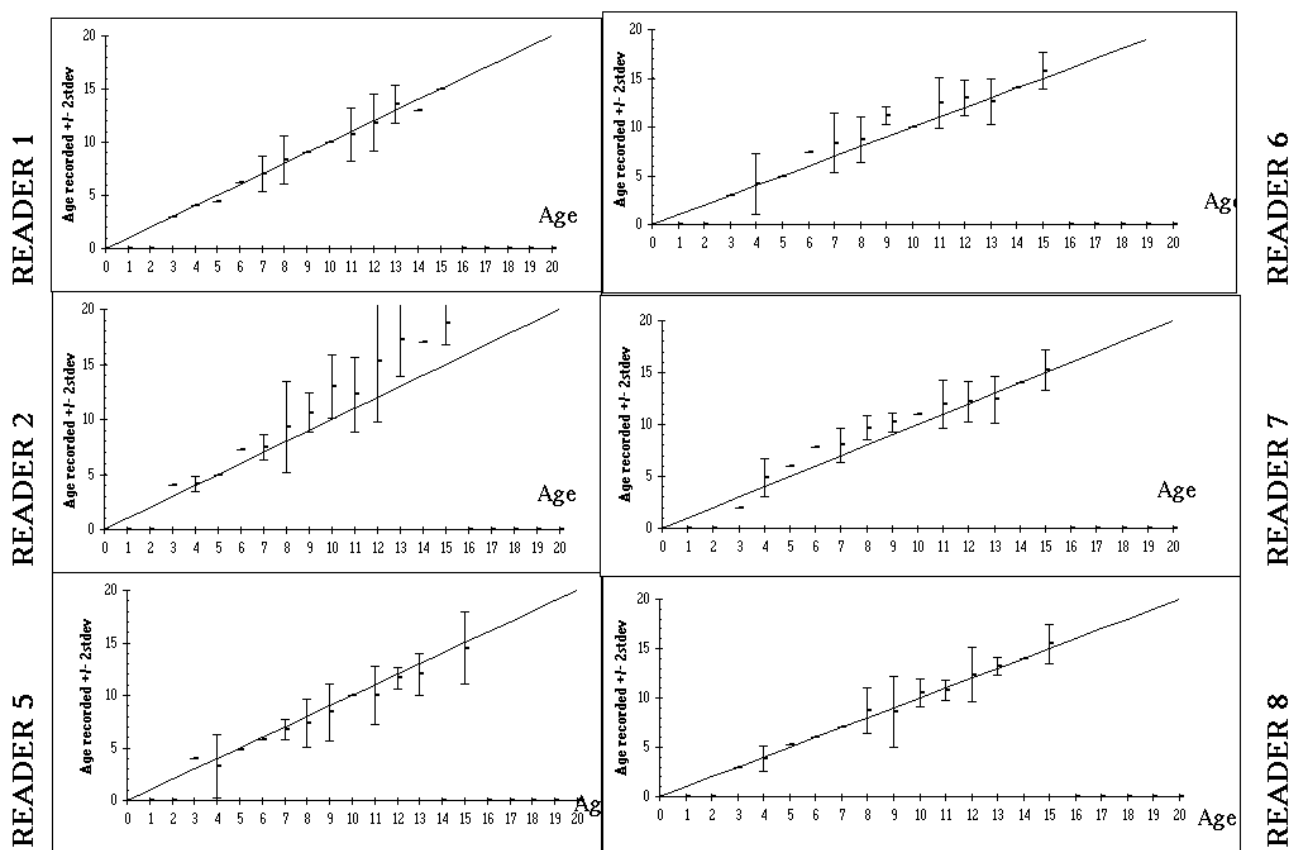
Figure 8a - *L. budegassa* Southern collection - 1st reading
In above age bias plots average age +/- 2stdev of each age reader is plotted against modal age.

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	3.2	4.0	5.1	6.7	7.4	8.7	9.7	10.8	11.4	12.7	13.5	14.4	15.8	-	-	-	-	-
2*stdev	-	-	-	1.5	2.0	1.7	2.0	1.8	2.7	2.8	2.4	2.9	3.8	4.1	3.0	3.4	-	-	-	-	-
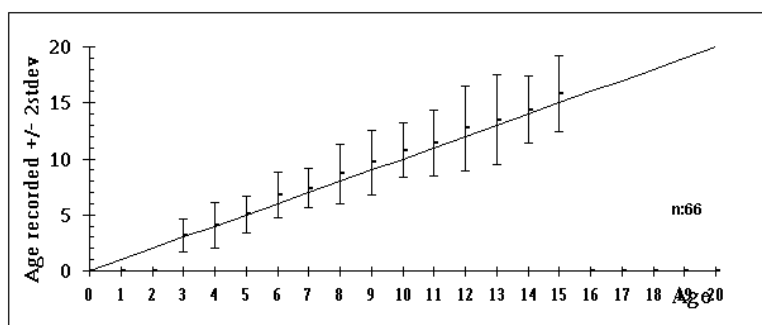
Figure 8b - *L. budegassa* Southern collection - 1st reading
In above age bias plot average age +/- 2stdev of all age readers is plotted against modal age.
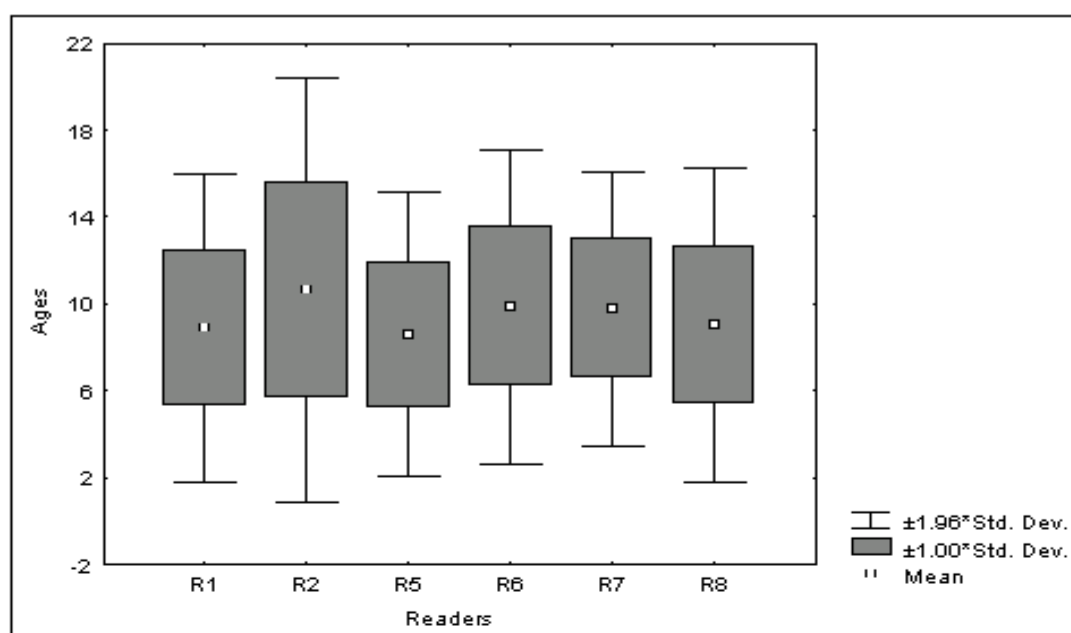
Figure 9 - *L. budegassa* Southern collection - 1st reading
Box-Whisker Plot of mean age, by reader.
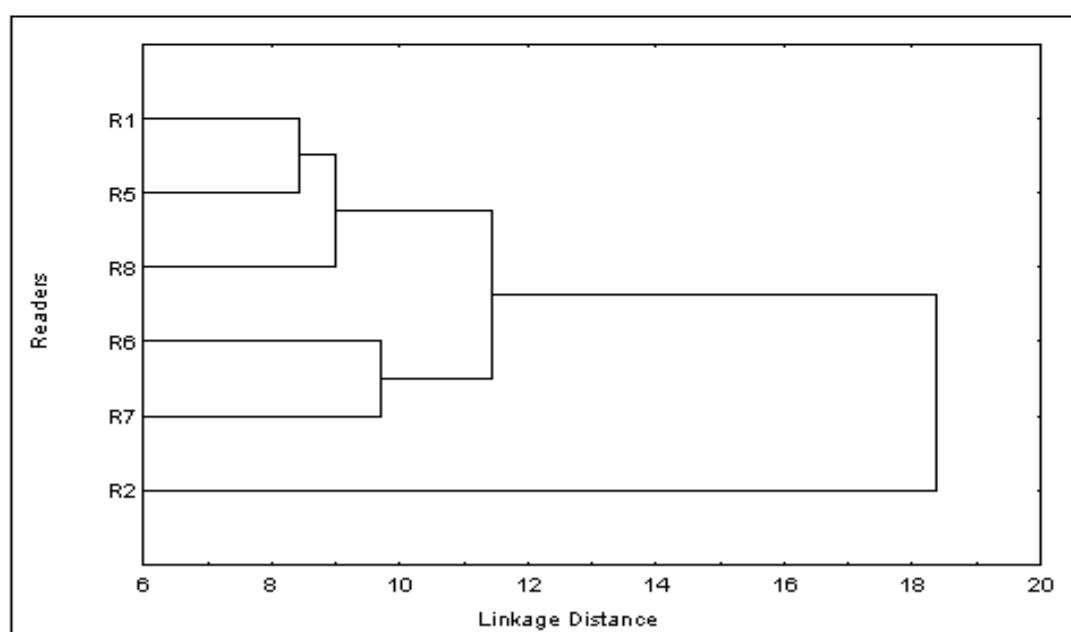
Figure 10 - *L. budegassa* Southern collection - 1st reading
Euclidean distances between readers.
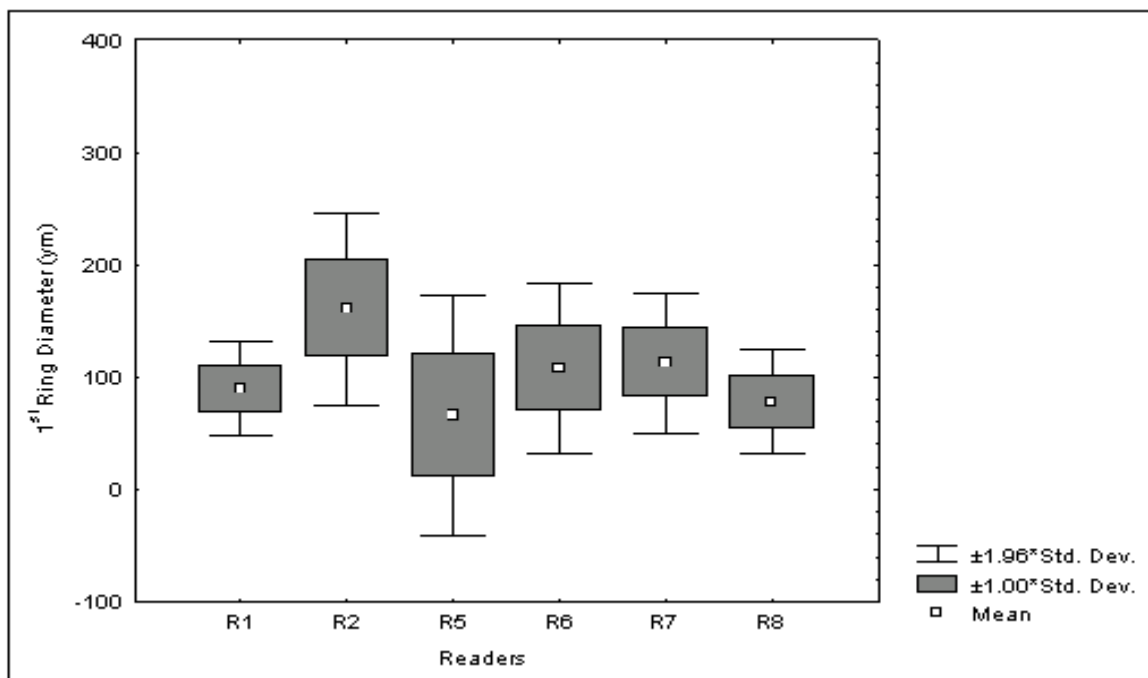
Figure 11 - *L. budegassa* Southern collection - 1st reading
Box-Whisker Plot for the average 1st ring diameter, by reader.
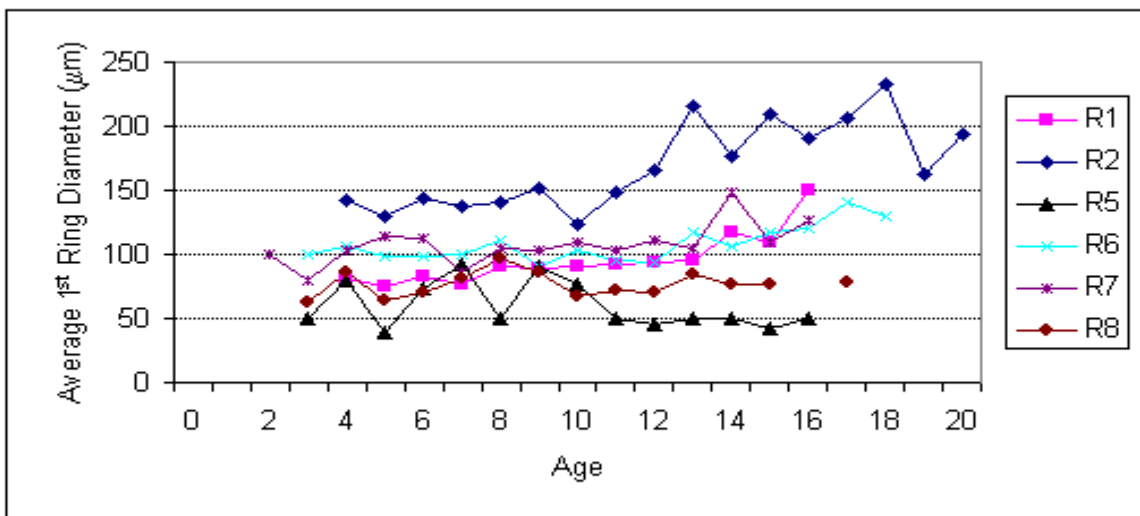
Figure 12 - *L. budegassa* Southern collection - 1st reading
Average 1st ring diameter by age, by reader.
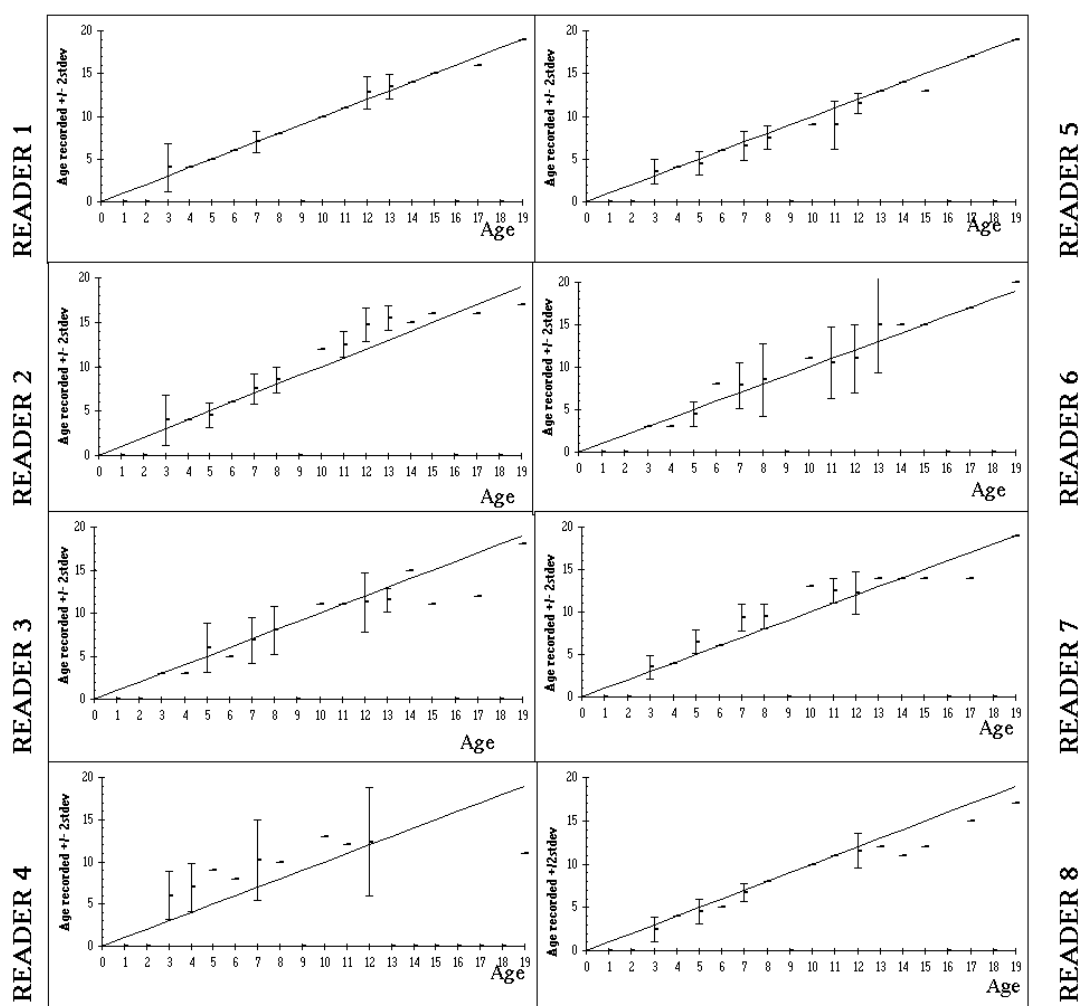
Figure 13a - *L. budegassa* **Northern collection - 2nd reading**
In above age bias plots average age +/- 2stdev of each age reader is
plotted against modal age.

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Age recorded	-	-	-	3.7	4.1	5.3	6.3	7.7	8.4	-	11.1	11.2	12.2	13.5	14.0	13.7	-	15.3	-	17.5
2*stdev	-	-	-	2.5	2.5	2.8	2.3	3.3	2.1	-	2.9	2.8	3.6	3.3	2.8	3.6	-	3.6	-	5.7
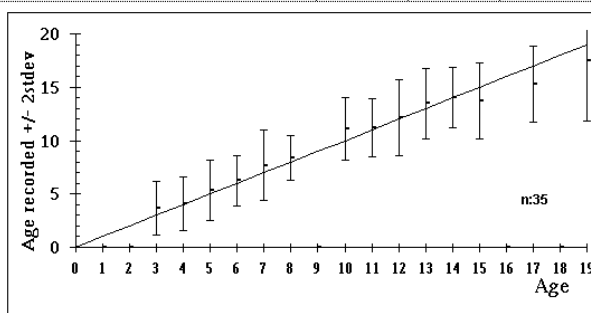
Figure13b - *L. budegassa* **Northern collection - 2nd reading**
In above age bias plot average age +/- 2stdev of
all age readers is plotted against modal age.
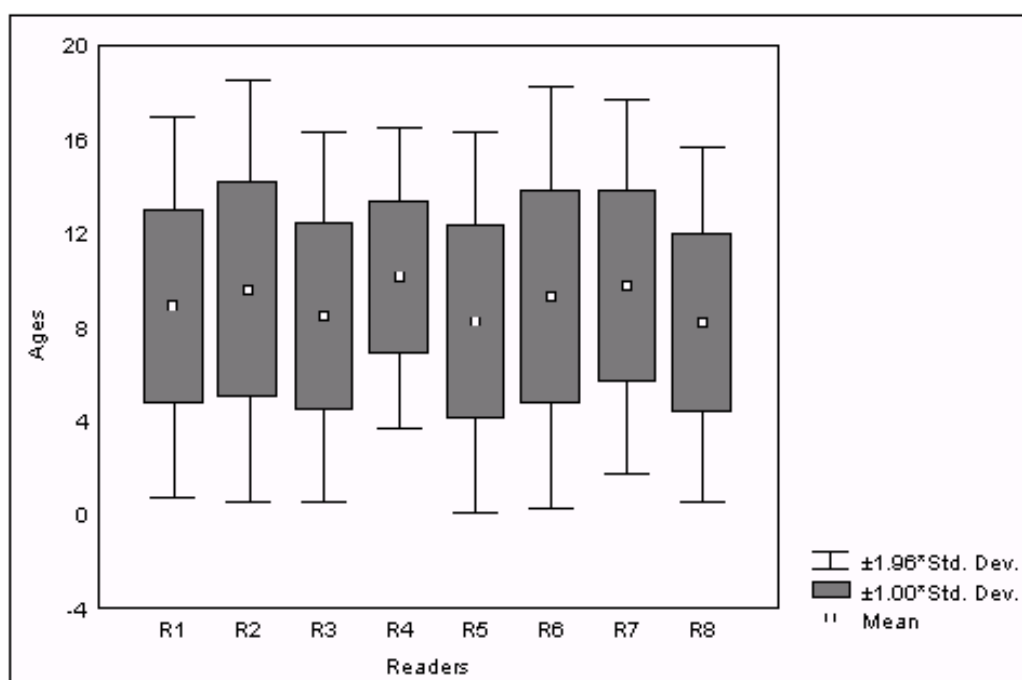
Figure 14 - *L. budegassa* Northern collection - 2nd reading
Box-Whisker Plot of mean age, by reader.
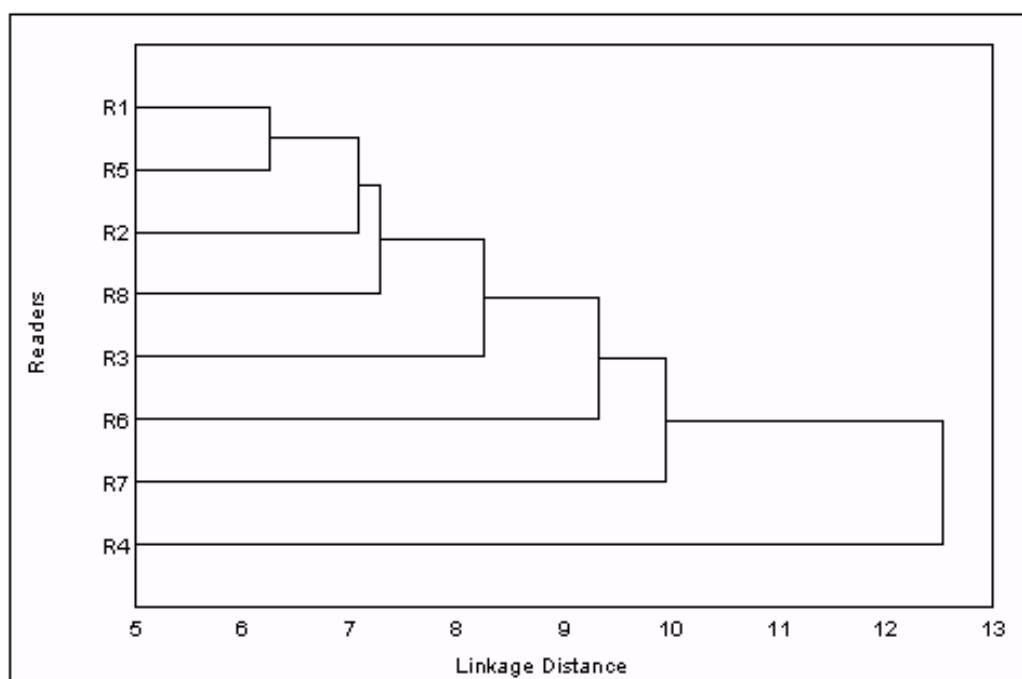
Figure 15 - *L. budegassa* Northern collection - 2nd reading
Euclidean distances between readers.
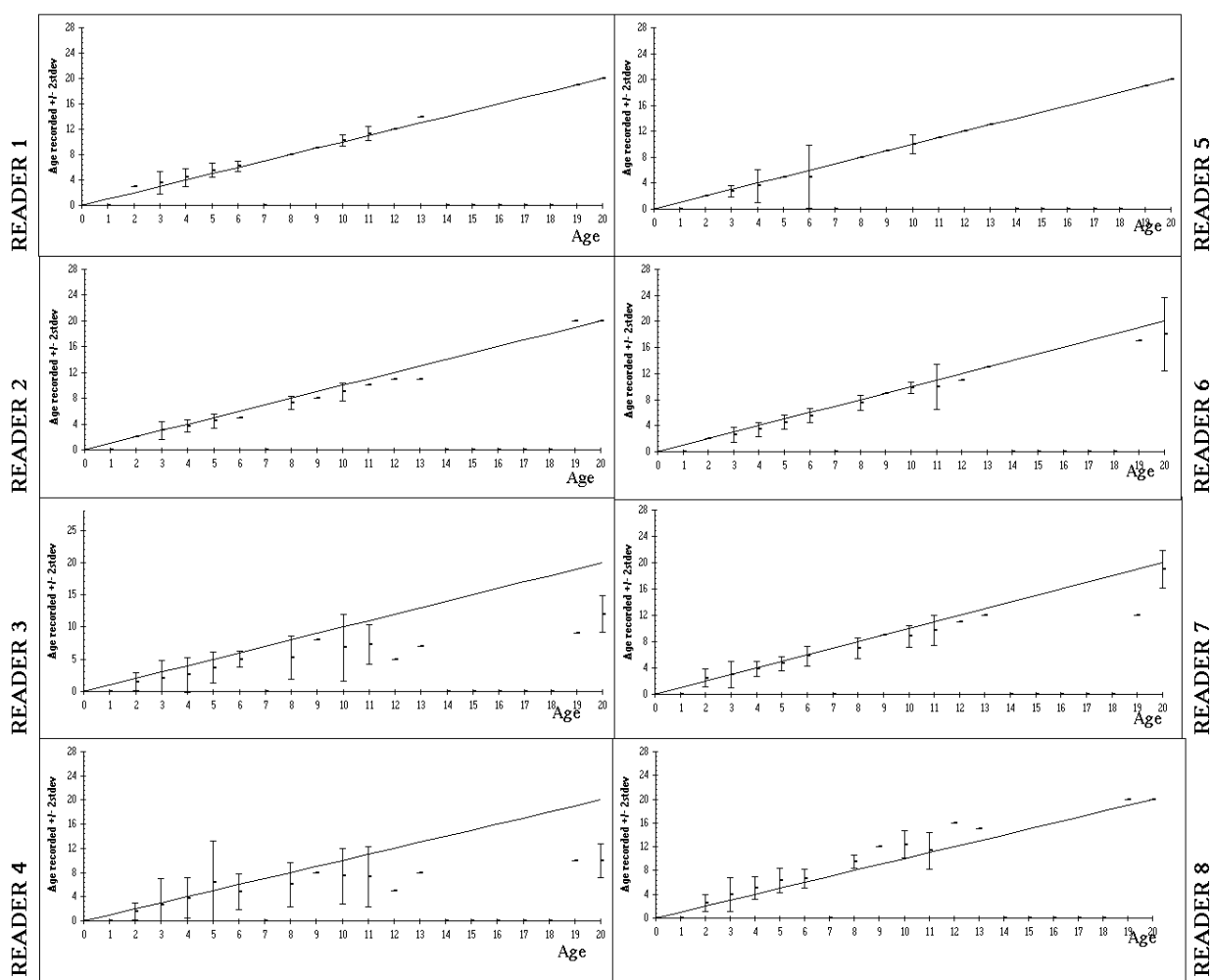
Figure 16a - *L. piscatorius* - Northern collection - 1st reading
In above age bias plots average age +/- 2stdev of each age reader is plotted against modal age.

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.13	2.95	3.80	5.06	5.50	-	7.31	9.00	9.30	9.75	10.38	11.63	-	-	-	-	-	15.75	17.38
2*stdev	-	-	1.24	2.48	2.37	3.13	2.44	-	3.02	2.62	4.16	3.88	7.40	5.65	-	-	-	-	-	9.30	8.03

Figure 16b - *L. piscatorius* - Northern collection - 1st reading
In above age bias plot average age +/- 2stdev of
all age readers is plotted against modal age.
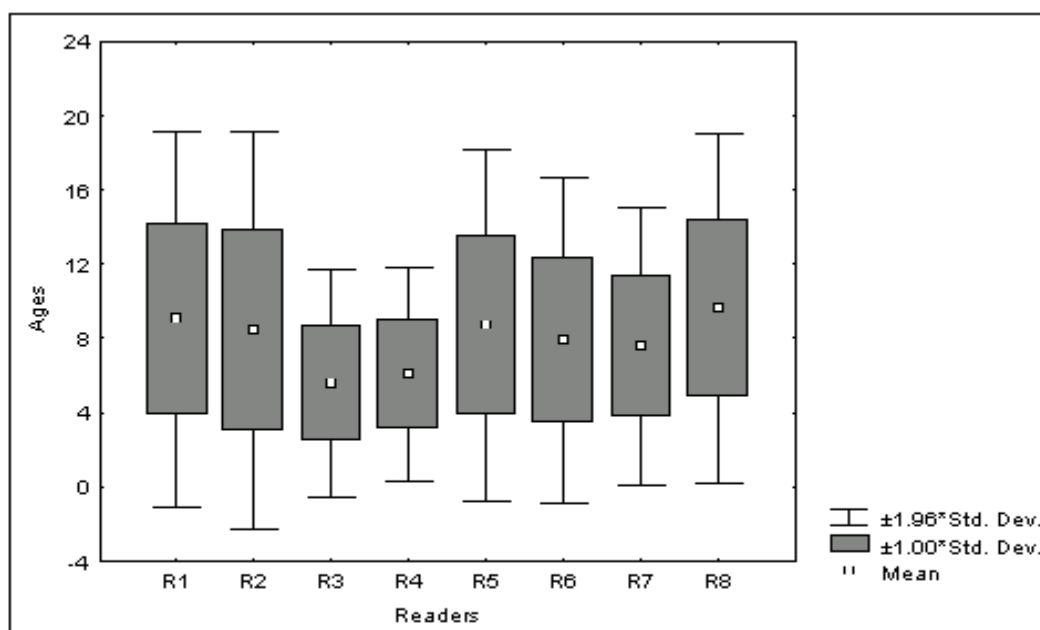
Figure 17 - *L. piscatorius* - Northern collection - 1st reading
Box-Whisker Plot of mean age, by reader.
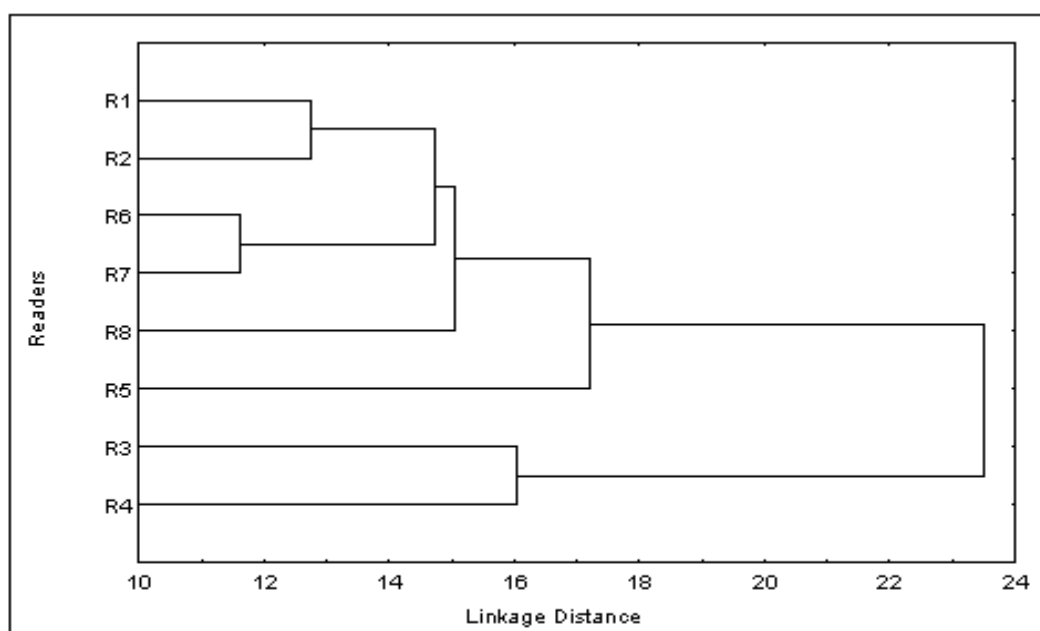
Figure 18 - *L. piscatorius* - Northern collection - 1st reading
Euclidean distances between readers.
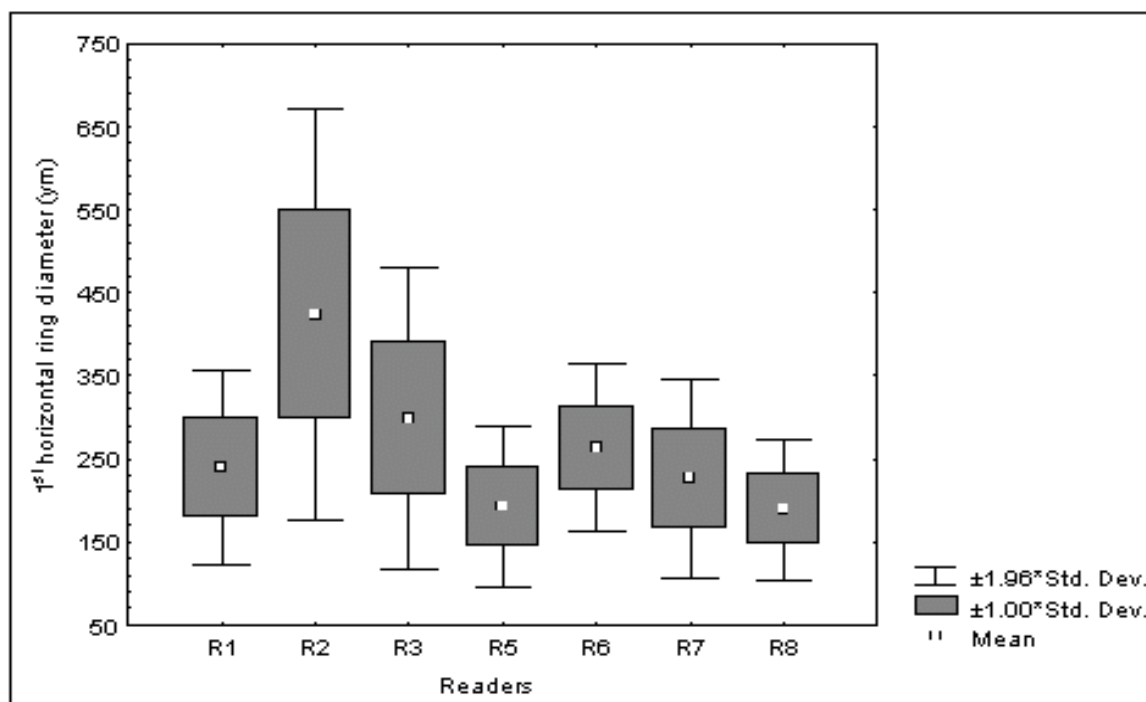
Figure 19 - *L. piscatorius* - Northern collection - 1st reading
Box-Whisker Plot for the 1st horizontal ring diameter, by reader.
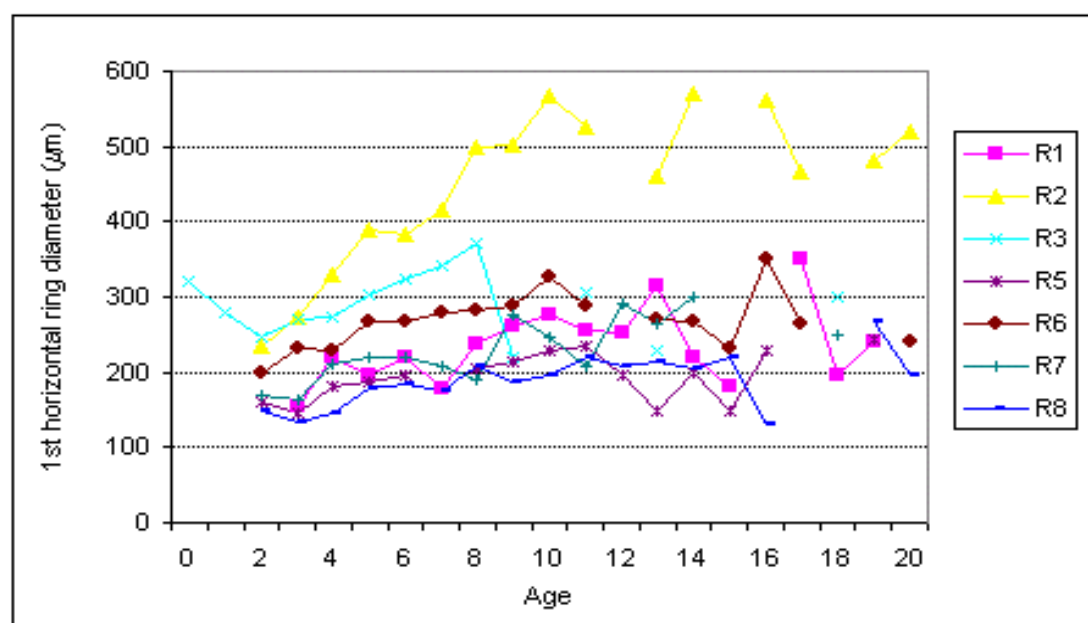
Figure 20 - *L. piscatorius* - Northern collection - 1st reading
Average 1st horizontal ring diameter by age, by reader.
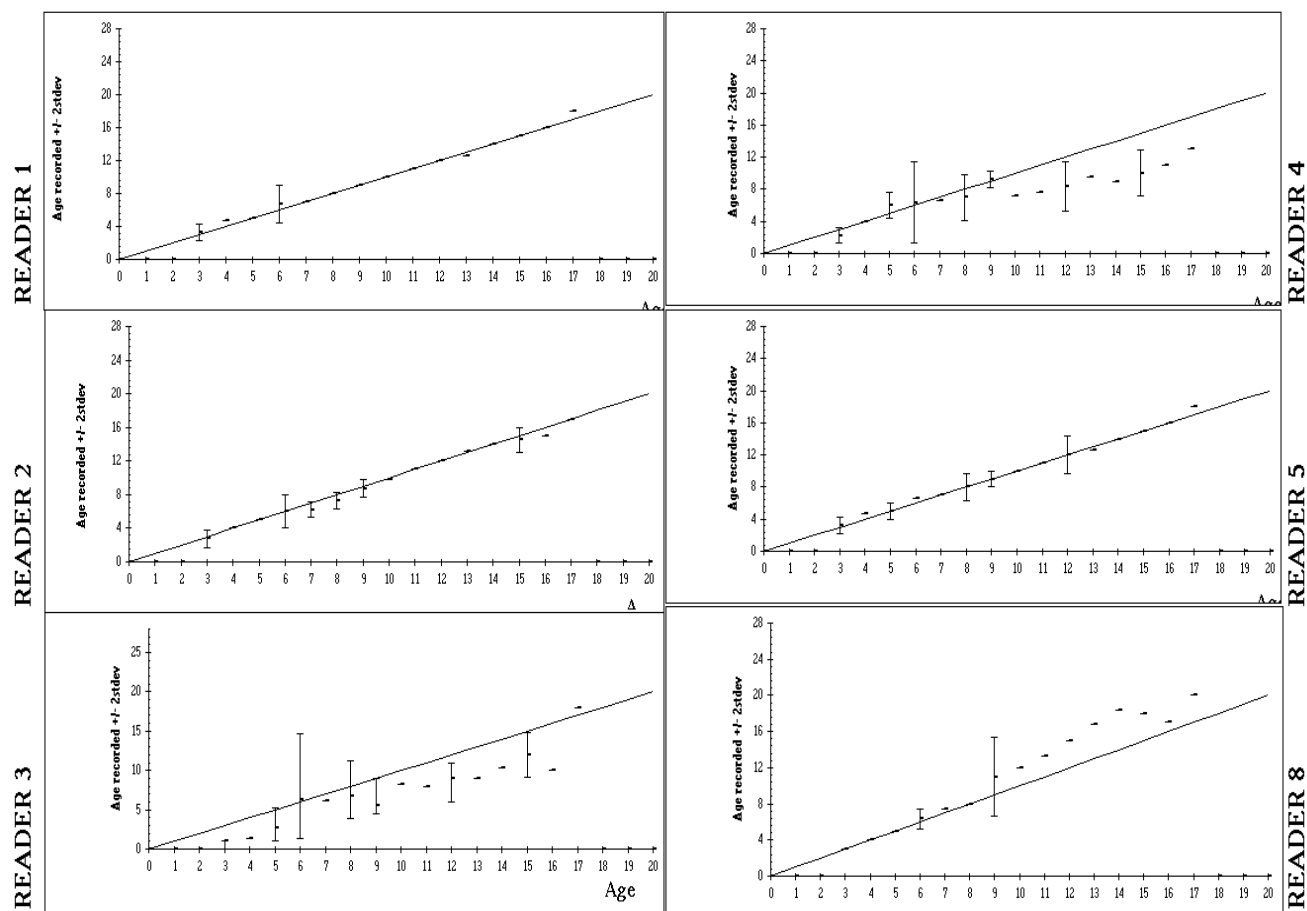
Figure 21a - *L. piscatorius* - Southern collection - 1st reading
In above age bias plots average age +/- 2stdev of each age reader is plotted against modal age.

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	-	1.88	2.75	3.63	4.71	5.05	5.63	6.59	7.45	7.83	8.58	9.20	9.79	10.56	10.63	12.88	-	-	-
2*stdev	-	-	-	2.63	3.88	4.70	6.34	6.09	6.89	8.45	9.64	9.93	10.94	11.86	12.96	13.43	14.02	16.37	-	-	-

Figure 21b - *L. piscatorius* - Southern collection - 1st reading
In above age bias plot average age +/- 2stdev of all age readers
is plotted against modal age (1st reading).
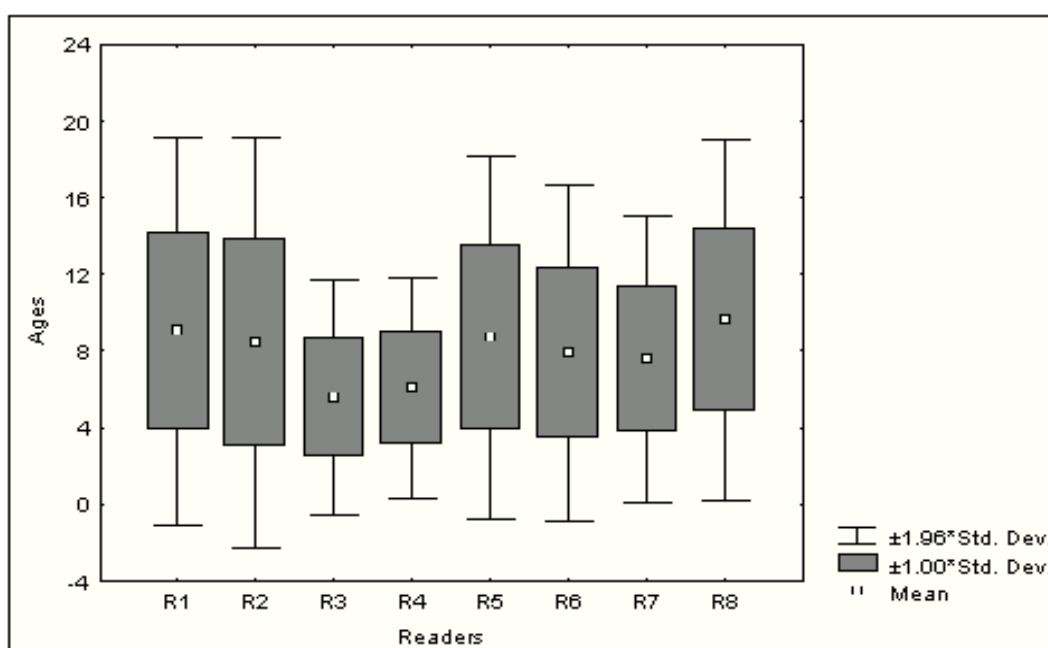
Figure 22 -   *L. piscatorius* - Southern collection - 1st reading
Box-Whisker Plot of mean age, by reader.
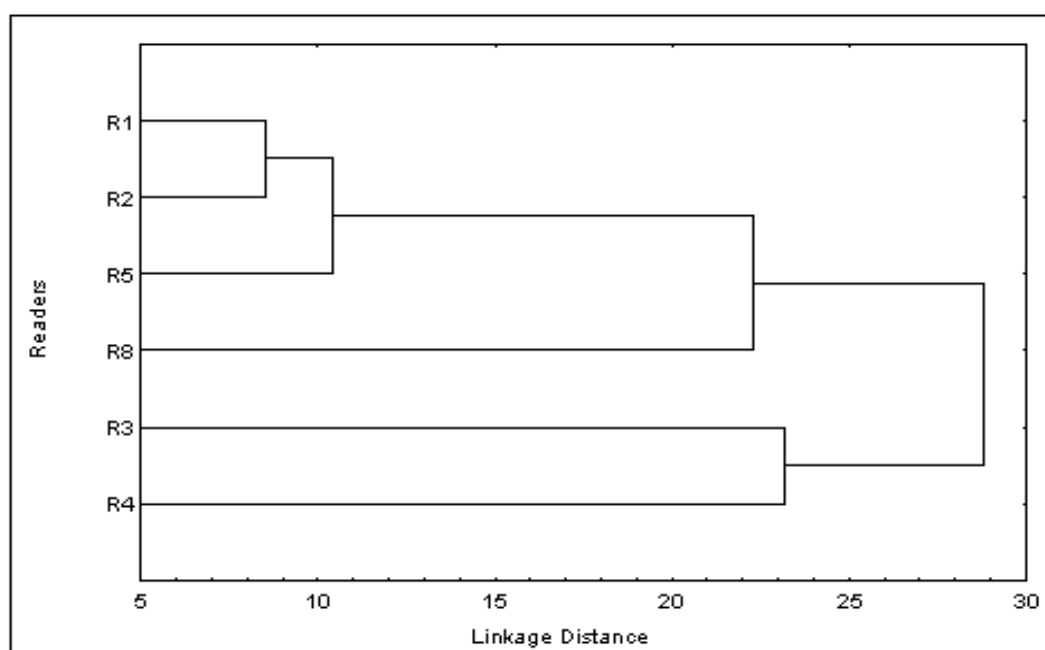
Figure 23 -   *L. piscatorius* - Southern collection - 1st reading
Euclidean distances between readers.
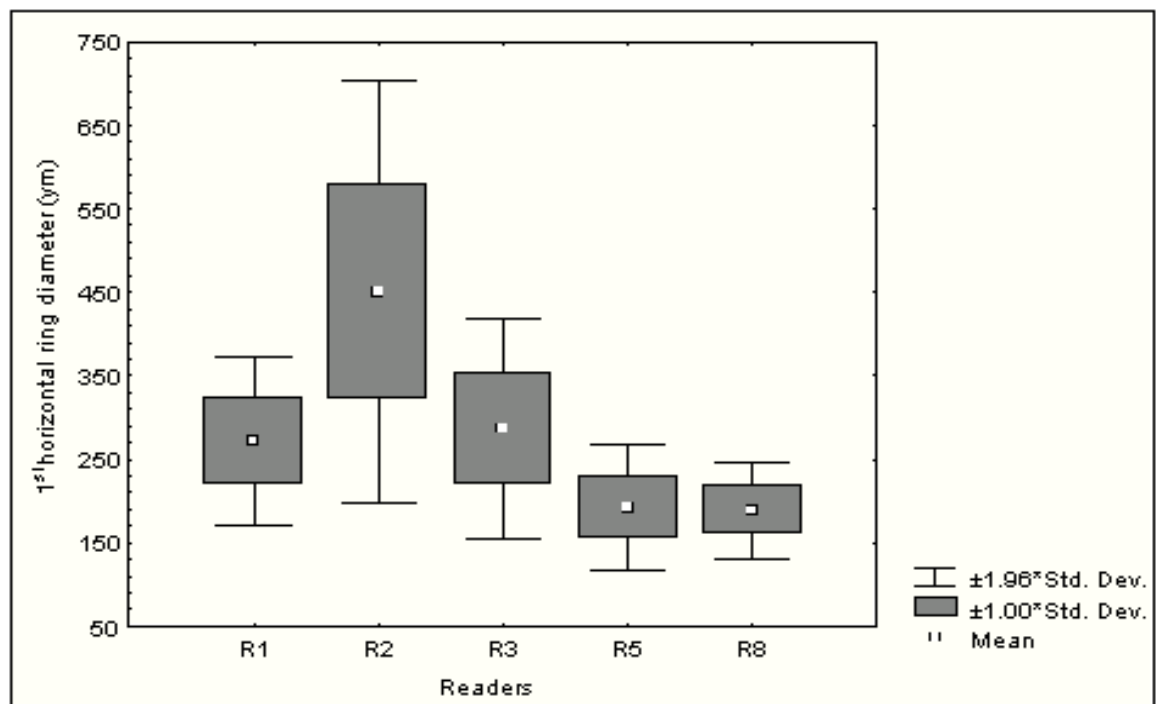
Figure 24 - *L. piscatorius* - Southern collection - 1st reading
Box-Whisker Plot for the 1st horizontal ring diameter, by reader.
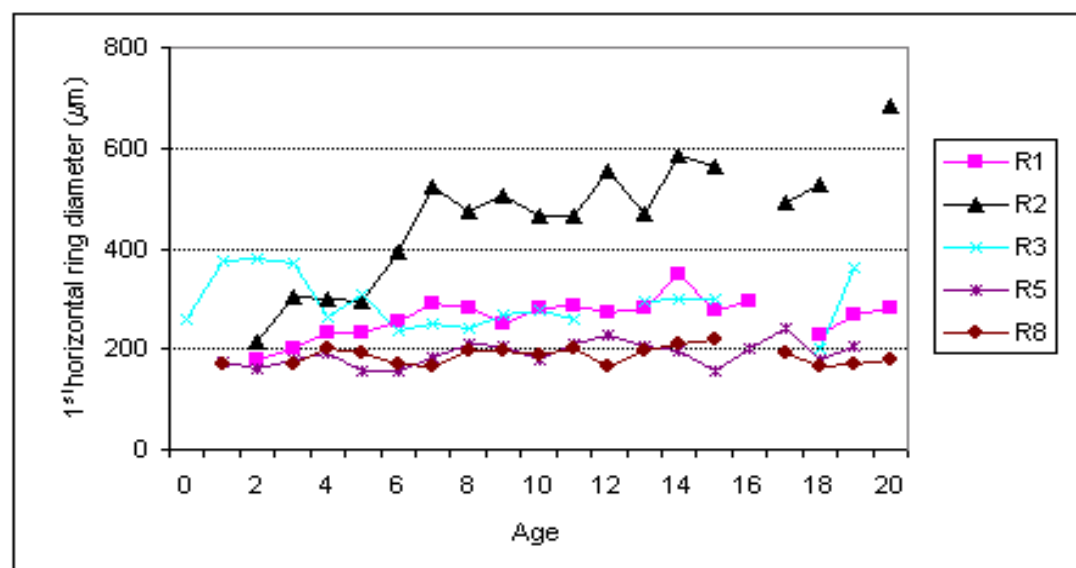
Figure 25 - *L. piscatorius* - Southern collection - 1st reading
Average 1st horizontal ring diameter by age, by reader.
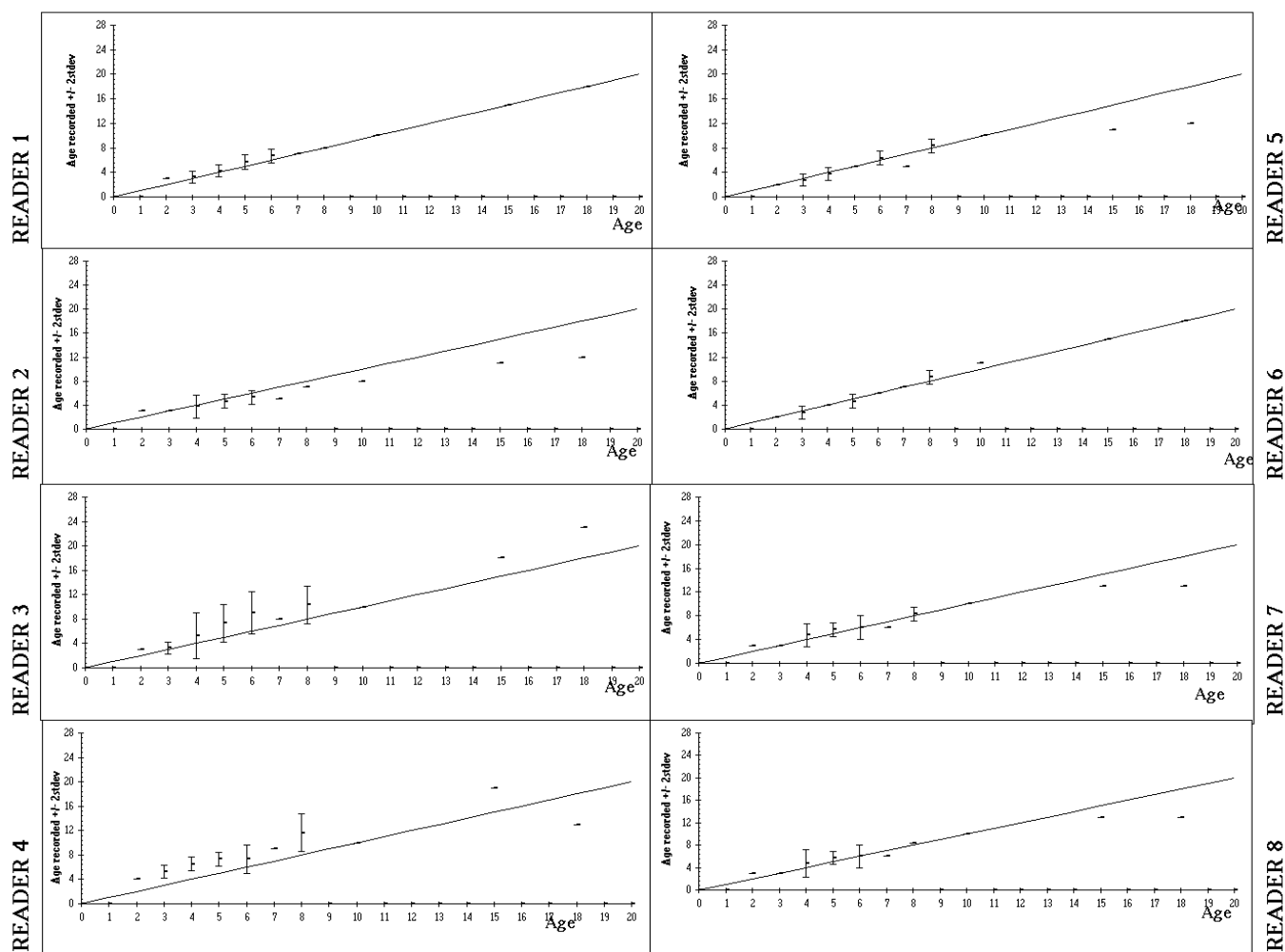
Figure 26a - *L. piscatorius* - Northern collection - 2nd reading

In above age bias plots average age +/- 2stdev of each age reader is plotted against modal age.

Modal age	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Age recorded	-	-	2.88	3.28	4.56	5.83	6.58	6.63	8.79	-	10.00	-	-	-	-	14.13	-	-	15.13	-	-
2*stdev	-	-	1.28	1.70	2.49	2.41	2.70	2.82	3.17	-	1.85	-	-	-	-	6.36	-	-	8.17	-	-

Figure 26b - *L. piscatorius* - Northern collection - 2nd reading
In above age bias plot average age +/- 2stdev of
all age readers is plotted against modal age.
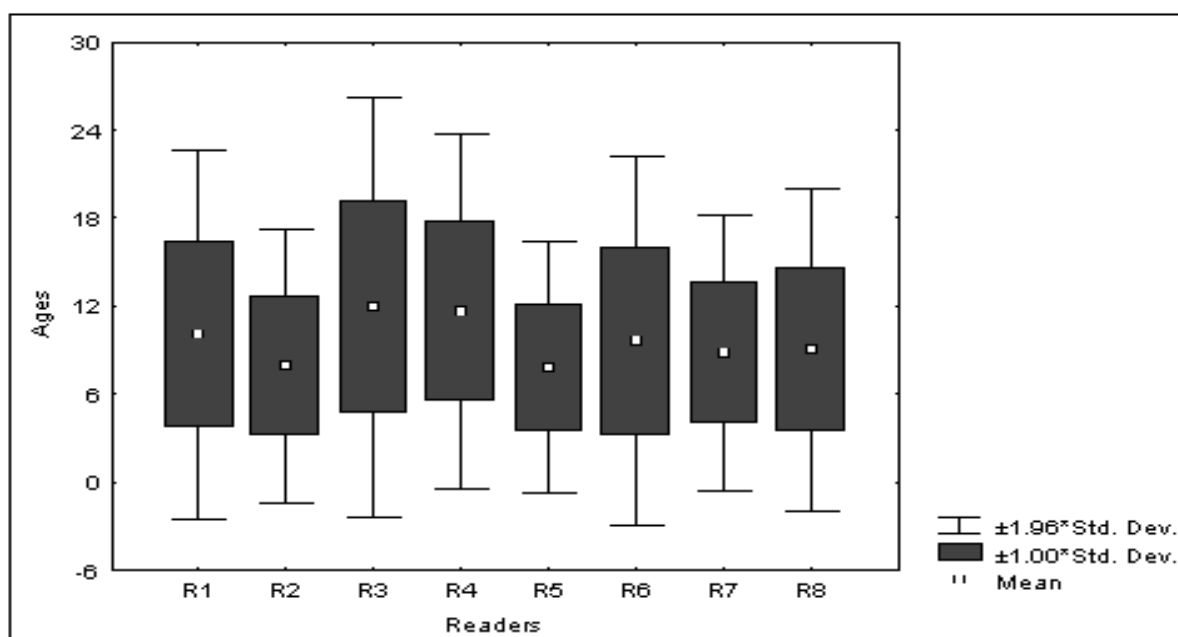
Figure 27 - *L. piscatorius* - Northern collection - 2nd reading
Box-Whisker Plot of mean age, by reader.
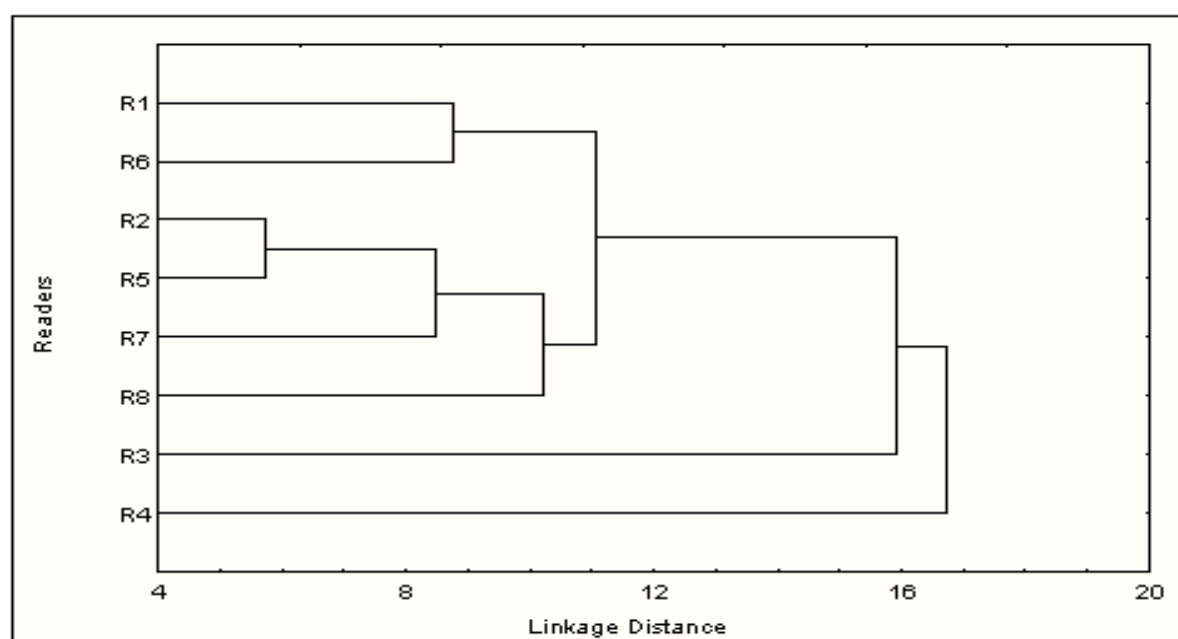
Figure 28 - *L. piscatorius* - Northern collection - 2nd reading
Euclidean distances between readers.

NAME	LABORATORY	ADRESS	PHONE	FAX	E-MAIL
Asier Zamakona	AZTI (Spain)	Txatxarramendi Irla s/n 48395 Sukarrieta	+34 94 6870700	+34 94 6870006	zamakona@rp.azti.es
Paulino Lucio	AZTI (Spain)	Txatxarramendi Irla s/n 48395 Sukarrieta	+34 94 6870700	+34 94 6870006	paulino@rp.azti.es
Iñaki Quincoces	AZTI (Spain)	Txatxarramendi Irla s/n 48395 Sukarrieta	+34 94 6870700	+34 94 6870006	inaxio@rp.azti.es
Jorge Landa	IEO (Spain)	Promontorio San Martín s/n Apdo. 240 39080 Santander	+34 94 2291060	+34 94 2275072	jorge.landa@st.ieo.es
Hervé Dupouy	IFREMER (France)	8, Rue François Toullec 56100 Lorient	+33 2 97873800	+33 2 97873801	hdupouy@ifremer.fr
Bernard Kergoat	IFREMER (France)	8, Rue François Toullec 56100 Lorient	+33 2 97873800	+33 2 97873801	bkergoat@ifremer.fr
Cristina Morgado	IPIMAR (Portugal)	Av. Brasília 1449-006 Lisboa	+351 1 3027061	+351 1 3015948	cmorgado@ipimar.pt
Manuela Azevedo	IPIMAR (Portugal)	Av. Brasília 1449-006 Lisboa	+351 1 3027148	+351 1 3015948	mazevedo@ipimar.pt
Rafael Duarte	IPIMAR (Portugal)	Av. Brasília 1449-006 Lisboa	+351 1 3027061	+351 1 3015948	rduarte@ipimar.pt
Fiona Woods	MIFRC (Ireland)	Abbotstown, Castleknock Dublin, 15	+353 1 8210111	+353 1 8205078	fwoods@frc.ie
Helen McCormick	MIFRC (Ireland)	Abbotstown, Castleknock Dublin, 15	+353 1 8210111	+353 1 8205078	helenmc@frc.ie

New Assessment and Biology of the Main Commercial Fish species: Hake and Anglerfishes of the Southern Shelf Demersal Stocks in the South Western Europe (Study Contract 97/015)

Black Anglerfish age reading – *Illicia* exchange 98/99

Dear colleagues,

One of the objectives of Study Project 97/015 (DEMASSESS) is to perform an exchange program of *illicia* between readers. Therefore, IPIMAR prepared a collection including 68 *illicia* of **Black** Anglerfish from the southern stock (Divisions VIIIc and IXa) and AZTI prepared 70 *illicia* from the northern stock. This exchange program should end with a workshop and the results should be available at the end of February in order to take them into account in the next year stock assessment.

ORGANIZATION OF THE COLLECTION

The methodology used to obtain the *illicia* sections is familiar to every reader: *Illicia* were mounted in a black resin and cut transversally using a slicing machine.

IPIMAR collection

The IPIMAR collection for this exchange program contains two sections from each *illicia* that were fixed over a microscope slide using "Entalan". To enhance the age reading it is recommended to cover the sections with a glycerine / alcohol mixture.

Each microscope slide is numbered from 1 to 20 (BUD – IPIMAR 01 to 20), corresponding this to the legend given in the annex. This legend informs about the *illicia* that should be read because not all *illicia* contained in the sections enter to the exchange program (the sections selected were mounted within the BIOSDEF project).

For some black anglerfishes not only the *illicia* was mounted but also the second dorsal fin ray. In these cases the *illicia* is legended with the number followed by an **a** and the 2nd ray is legended with the same number of the illicium followed by a **b**. As referred before, each microscope slide contains two sections from the same *illicia* that obviously correspond to different cut positions. These cut positions are taken as shown in the next Figure and the respective distances are given in the legends.
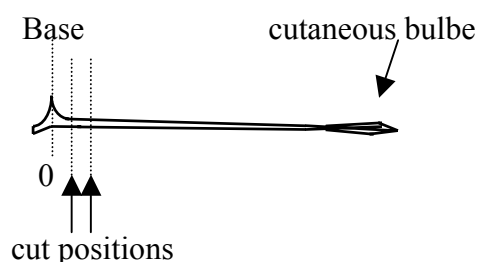
The general scheme is exemplified in the next diagram:

Microscope slide legend

BUD – IPIMAR - 06

Illicia to read: In bold
Illicia not to read: crossed and shaded

	1	2 a	2 b	3	4 a	4 b	5 a	5 b	6	7	8	9	10	11
Illicium / 2nd ray	*Illicium*	*Illicium*	*2nd ray*	*Illicium*	*Illicium*	*2nd ray*	*Illicium*	*2nd ray*	*Illicium*	*Illicium*	*Illicium*	*Illicium*	*Illicium*	*Illicium*
Lt. (cm)	21	22	22	23	23	23	23	23	24	24	24	25	25	25
Date	Jul. 97	Jul. 97	Jul. 97	Jul. 97	Sep. 97	Sep. 97	Sep. 97	Sep. 97	Jul. 97	Jul. 97	Jul. 97	Jul. 97	Jul. 97	Jul. 97
Age														
Ray of ring (ym)														

Cut position: Section 4 $\Rightarrow$ 4.8 mm
Section 5 $\Rightarrow$ 6.1 mm

B41-F2 – C4+C5

Microscope slide

BUD – IPIMAR 06

4   ○ ○ ○ ○ ✖✖ ✖✖ ○ ✖ ✖ ✖ ✖ ✖

5   ○ ○ ○ ○ ✖✖ ✖✖ ○ ✖ ✖ ✖ ✖ ✖

AZTI collection

The AZTI collection for this exchange program contains **only one** section from each *illicium*. Each set of illicia were fixed over a microscope slide using "Eukitt". To improve the readability of the illicia they have been finally covered also with "Eukitt" resin. Thus it is <u>no necessary</u> –according to our experience- to cover again the AZTI sections with a glycerine / alcohol mixture.

The collection prepared by AZTI for the exchange program consists on 70 *illicia* of **Black Anglerfish (Lophius budegassa** [ANK]) from the northern stock (Divisions VIII a,b,d). These *illicia* are described by length and semester (half year) in the file **BUD-AZTI.xls** (Excel 5.0/95), in the sheet "Length_order".

The *illicia* are included in plates or microscope slides that have a number corresponding to the number of order in the 1997 AZTI routinary collection of Northern *Lophius*. A complete description of all the plates used is presented in the sheets "Plates_Bude"/"Readings_Bude" of the file (**BUD-AZTI.xls**). This description informs about the *illicia* that should be read because not all *illicia* contained in the plates are considered in the present exchange program.

There are two main differences in relation to the IPIMAR collection:

- <u>Only *illicia*</u> were mounted but no the second dorsal fin rays.
- Each microscope slide contains <u>only one section</u> from each *illicium*.

In the AZTI collection all *illicia* have been usually cut at the same position -i.e. at about 5 mm from the *illicium* basis, or more accurately between 4.5 mm (lower position) and 5.5 mm (upper position of the cut)- and all of them have a thickness of about 500 micro-m. (The total losses caused by the abrasion of the two saw cuts are estimated to be also around 500 micro-m).

Explanation of the AZTI plates legends

A general overview of all the *illicia* collection is indicated graphically in the sheets "Plates_Bude" that is contained in the file "**BUD-AZTI.xls**". The common scheme used in each microscope plate/slide is exemplified in the next diagram:
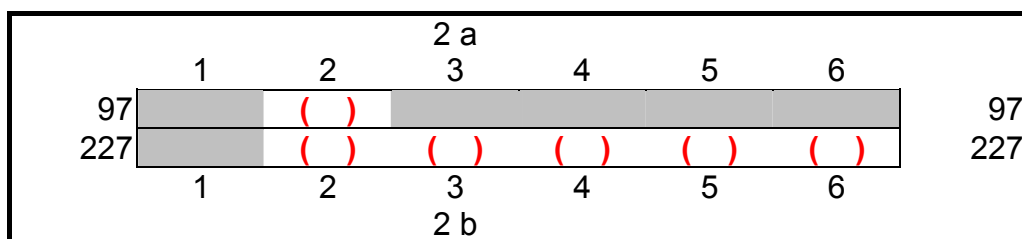
97:     Number of the sampling year (i.e. 1997)
227:    Number of plate/slide (in the order of the routinery AZTI collection)
2a/2b: Number and position of the raws. (a: upper row; b: lower raw).
        (The numbers must not be taken into account: they correspond only to the AZTI routinary sampling codes and indicate the order of files obtained in the processing of the black resin plates).

1,2,3... Number of order of each *illicium* in the raw.

[shaded box] The shaded boxes mark the *illicia* that must not be read.

( ) The numbers closed in circles indicate the *illicia* to be read. To do the searching in the plate/raw easier, these *illicia* have been marked in the slides with a circle.

GENERAL INSTRUCTIONS

The general instructions to be used with this collection are the following ones:

- All data will be introduced in the sheets "Readings_Bude" for Northern *L. budegassa* (file: **BUD-AZTI.xls**) and in the file: **BUD-IPIMAR.doc** for Southern *L. budegassa*. The sheets will be sent by E-mail (electronic copy) and mail (hard copy) to Manuela Azevedo, IPIMAR.

- Fill the name of reader and Institute, the date of reading and the magnification used in the reading. (It is recommended to employ always the same magnification, i.e. 100x).

Each reader:
- Should attribute an age to each section and the respective ageing credibility using the following codes:

    u – unreadable
    b – bad credibility
    m – medium credibility
    h - high credibility

    Example: **2m** $\Rightarrow$ age 2 and medium credibility
         3/4b $\Rightarrow$ age 3 or 4 with bad credibility

    When two possible ages are indicated (v.g. 5/4), the first one is considered to be the more reliable (i.e. the age 5 in the 5/4 case).

- Measure the ray of the **first annual ring** as shown in the next Figure, taken as the average distance of the 4 measurements performed in the illustrated directions (the lines showing the anterior, posterior, left and right directions).
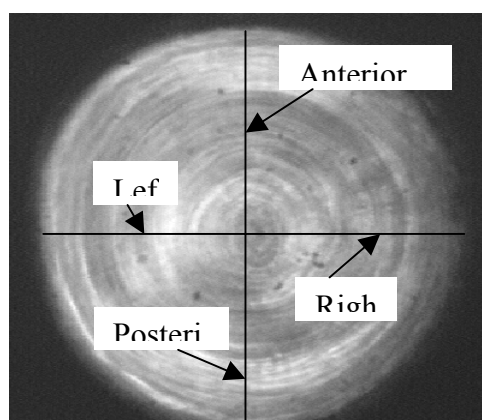
Alternatively, we suggest to measure the **diameter** instead of the ray if considered more accurate and easier. In this case the diameter can be given by taking two perpendicular distances, i.e. the vertical and the horizontal diameter. The measurements will be done comprising the more outer part of the zone of the first annual ring (estimated by the reader). The values should be expressed in micra units.

- All the 138 *L. budegassa illicia* samples should be sent to the next reader, following the proposed schedule (see next page).

If you have any doubts or need any kind of help about the southern *L. budegassa* samples please contact Manuela Azevedo (mazevedo@ipimar.pt) or Rafael Duarte (rduarte@ipimar.pt) at IPIMAR (tel: 351-1-302 7000; fax: 301 59 48). Regarding the northern samples please contact Paulino Lucio (paulino@rp.azti.es) or Marina Santurtún (marina@rp.azti.es) at AZTI-Sukarrieta (tel: 34-94-687 0700; fax: 34-94-687 0006).

As you know, a very usefull reference for this exchange is: "International ageing workshop on European monkfish". Lorient, 25-28 June 1991 and 9-11 July 1997. IFREMER, 1997. Coord. Hervé Dupouy.

PARTICIPANTS AND READING SCHEDULE

→ Send the *illicia* collection to
⤍ Send the forms to IPIMAR - Lisbon
━ At IPIMAR - Lisbon

AZTI
Vizcaya
Paulino Lucio
08-23/Nov.98

IPIMAR
Lisbon
Manuela Azevedo
Rafael Duarte
01-15/Dec.98

IEO
Santander
Jorge Landa
15-30/Oct.98

Marine Institute
Dublin
Paul Connolly
02-16/Jan.99

IPIMAR
Lisbon
Manuela Azevedo
Rafael Duarte

IFREMER
Lorient
Hervé Dupouy
23-30/Jan.99

(IPIMAR)
Preliminary
analysis of the
results

WORKSHOP
(IPIMAR)

08–12/Mar.99
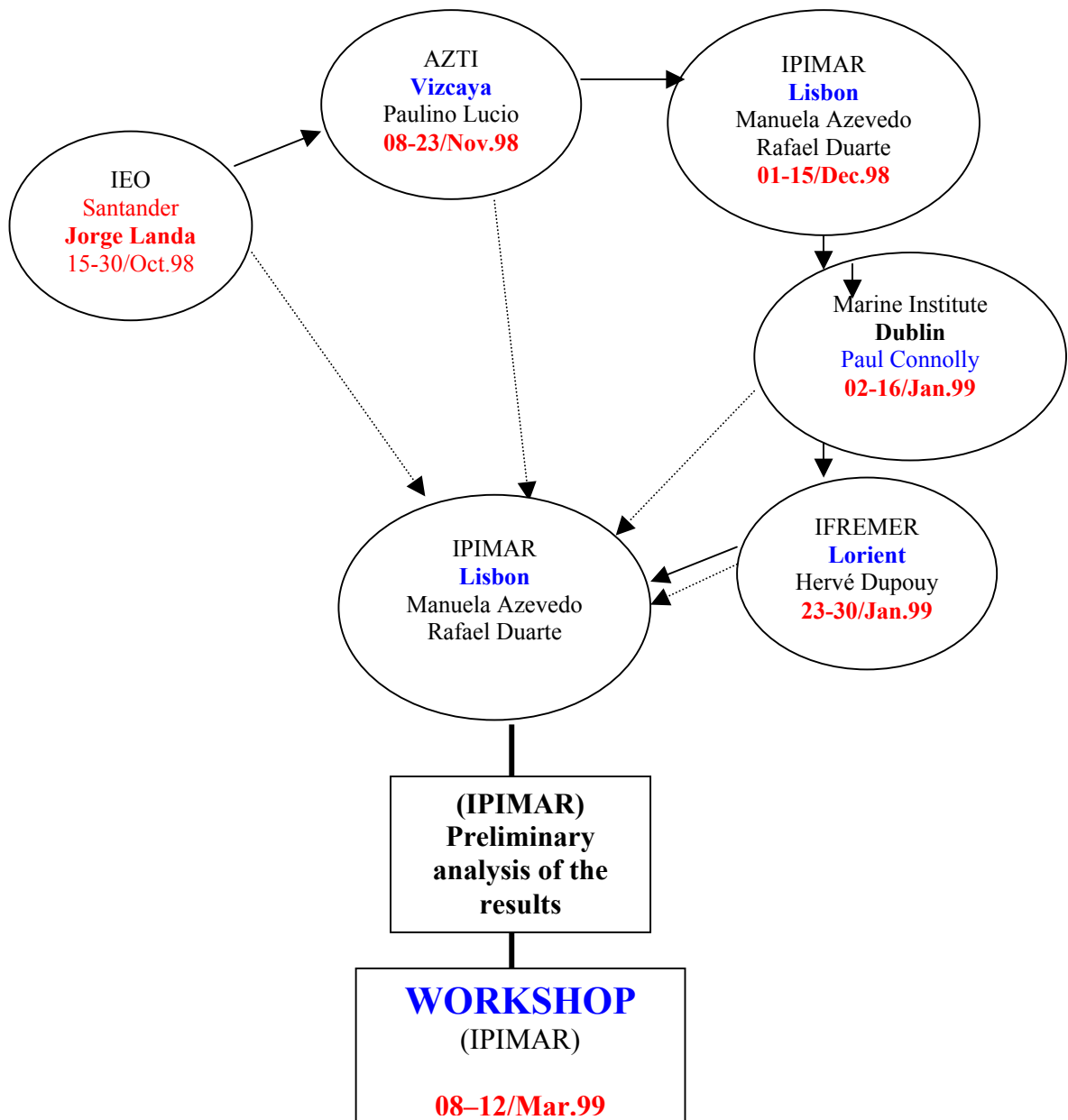
IPIMAR *illicia* considered for the exchange program

Total Length	Number		Total length	Number
20			60	1
21	1		61	1
22	1		62	1
23	1		63	1
24	1		64	1
25	1		65	1
26	1		66	1
27	1		67	1
28	1		68	1
29	1		69	1
30	1		70	1
31	1		71	1
32	1		72	1
33	1		73	2
34	1		74	1
35	1		75	1
36	1		76	1
37	1		77	1
38	1		78	
39	1		79	1
40	2		80	1
41	1		81	1
42	1		82	1
43	1		83	1
44	1		84	1
45	1		85	1
46	1		86	
47	1		87	1
48	1		88	1
49	1		89	
50	1		90	
51	1			
52				
53	1			
54	1			
55	1			
56	2			
57	1			
58	1			
59	1		Total	68

A
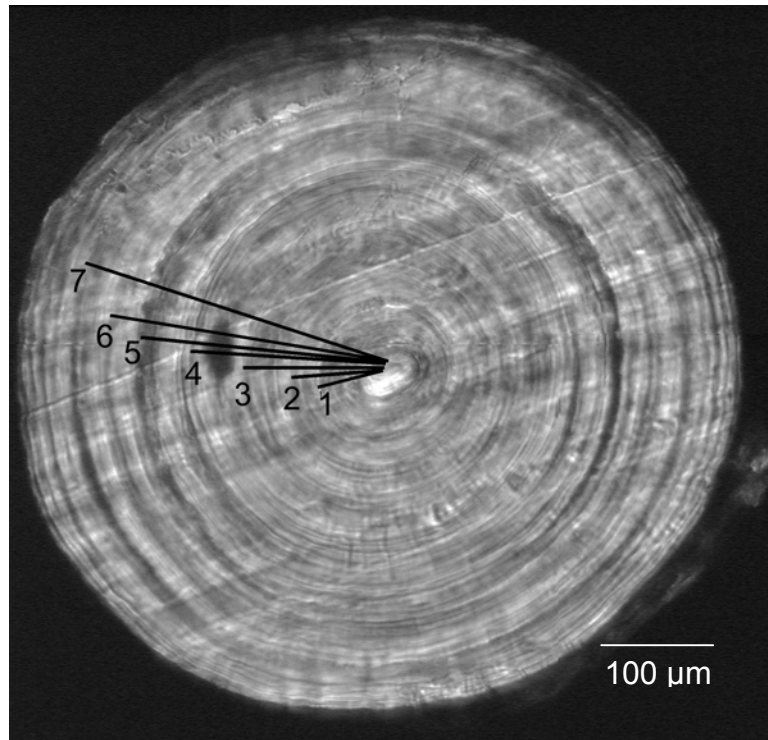
B
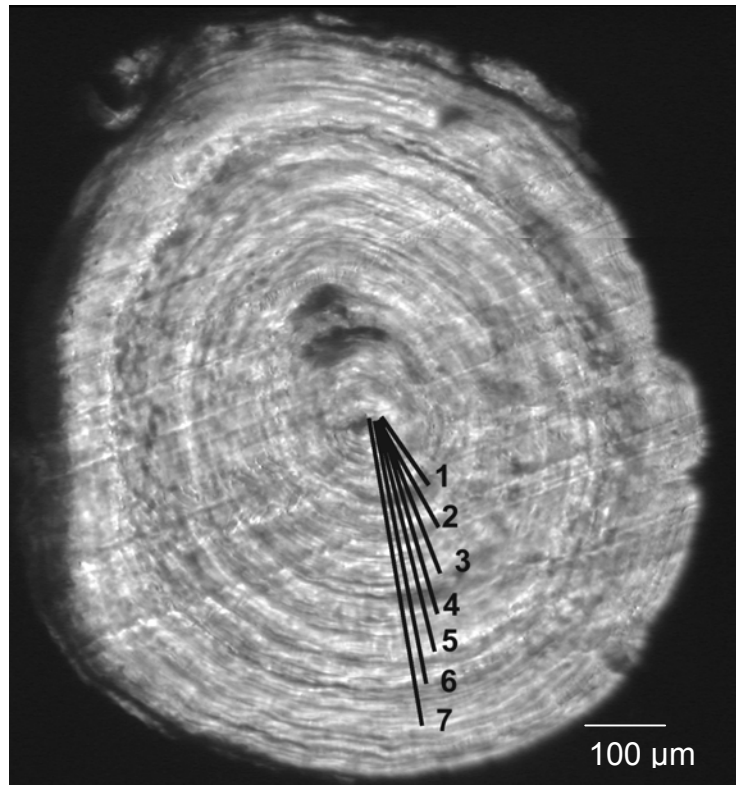
Image 1.
Lophius budegassa from the southern collection, with 37.8 cm total length. In Image **A** is the *illicium* (1/8a), 7 annual rings are visible. In Image **B** is the 2nd dorsal fin ray (1/8b) and 7 annual rings are also visible. The first ring in the 2nd dorsal ray is larger compared to the *illicium*. This is a consequence of the biology of the species, during the larval development the *illicium* appears after the 2nd fin ray.
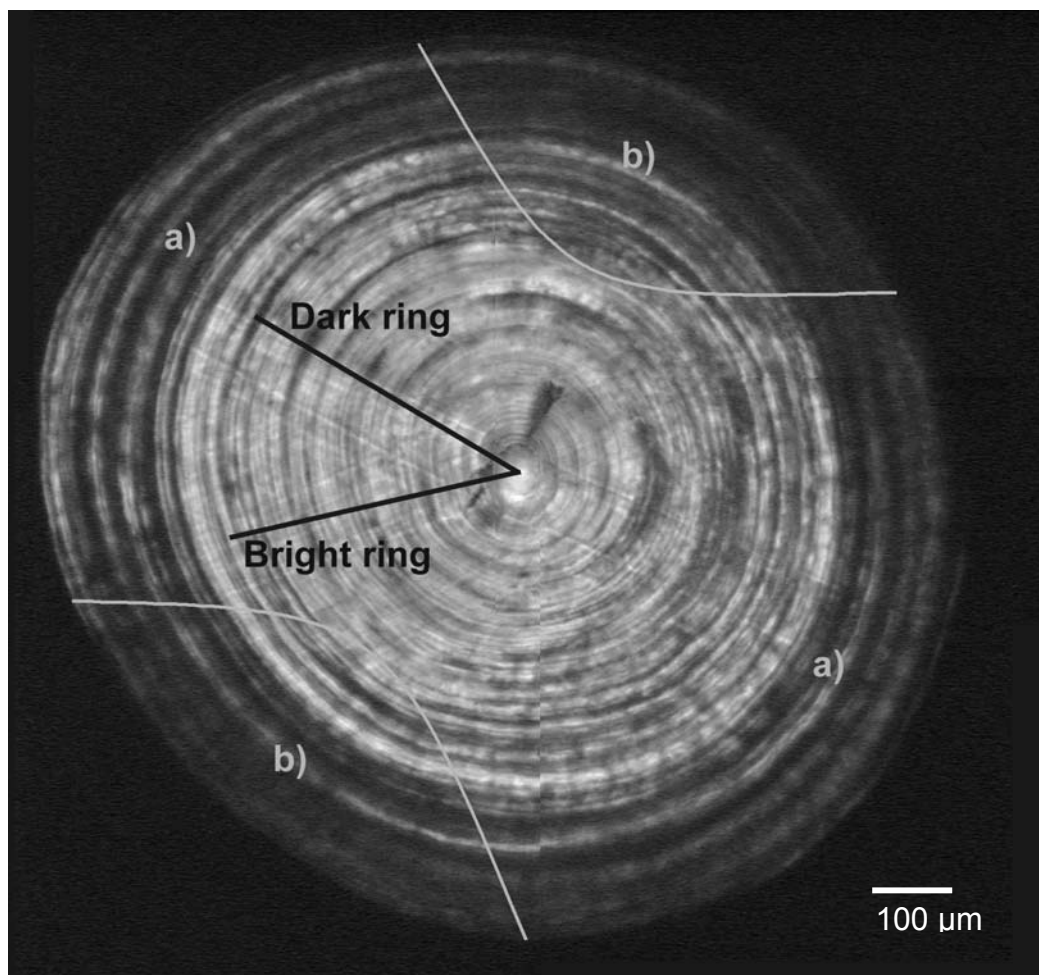
Image 2.
Lophius budegassa from the northern collection (*Illicium* 368/5a/6) with 64 cm in length. Region a) of the *illicium* with good contrast between rings and region b) with low contrast. Some rings visible in region a) are not distinguishable in region b). Relative to the ring coloration, there are two well marked dark rings in a certain region of the *illicium* and in another region of the cut the dark part disappears and a bright part is very visible and easy to count.
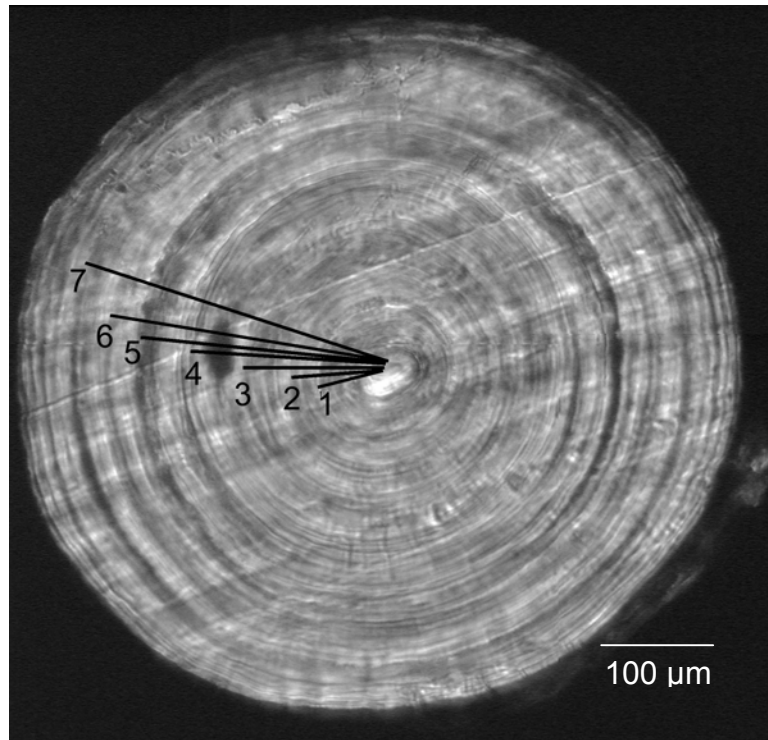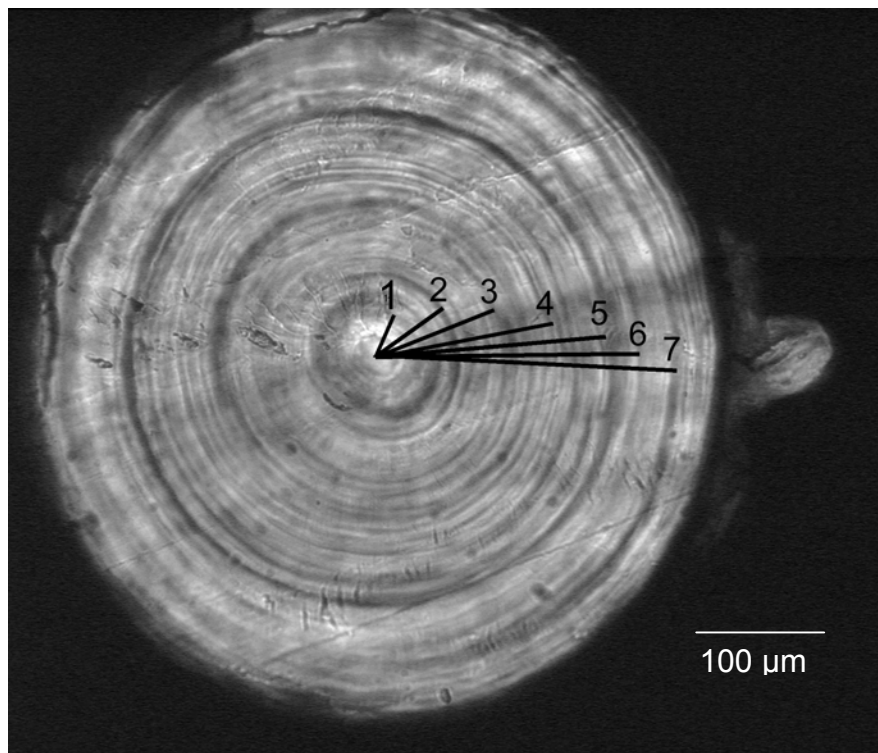
Image 3.
Lophius budegassa from the southern collection (*Illicium* 1/8a) with 37.8 cm total length. Two images from the same *illicium* at different cut positions. Image **A** was obtained at 7.3 mm above the base and Image **B** was obtained at 11.6 mm above the base. Size differences between both images are important and should be considered in the age reading process.
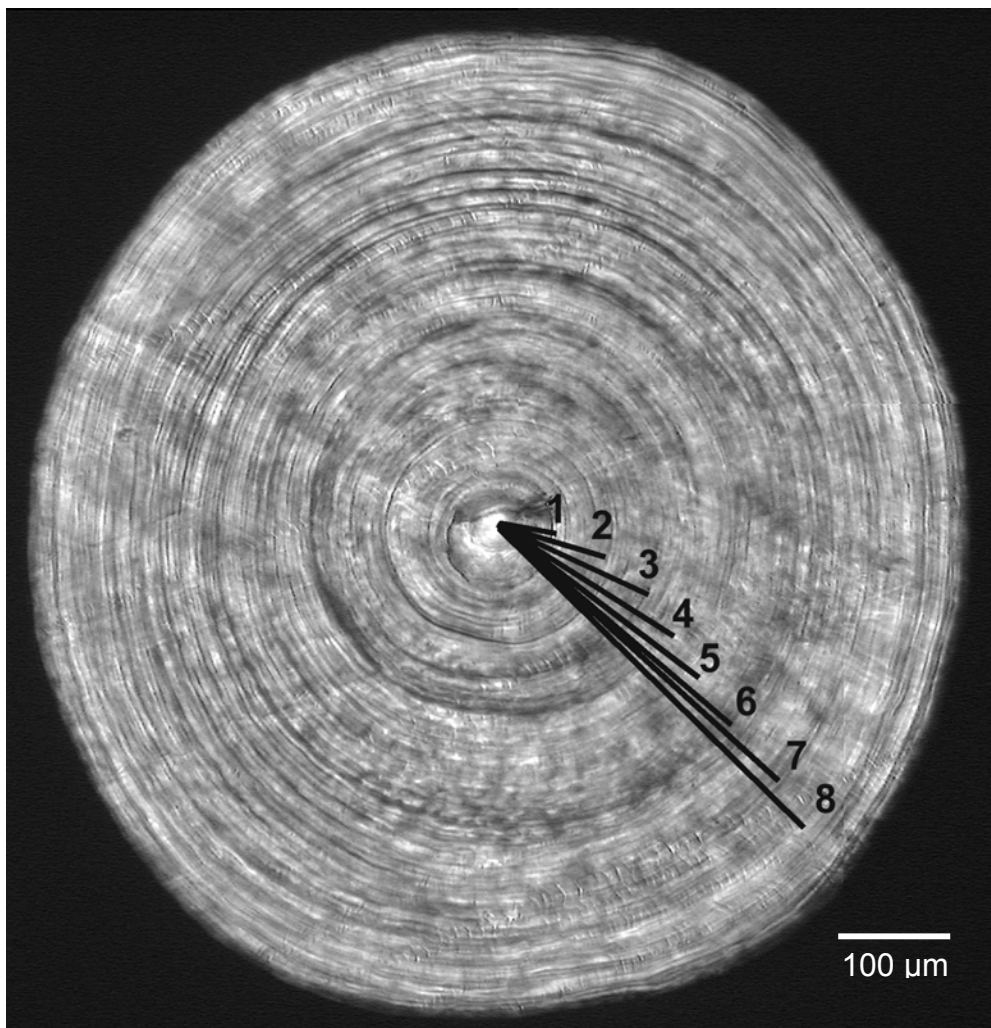
Image 4.
Lophius budegassa from the northern collection (*Illicium* 227/2b/2) with 52.7 cm in length. There are 8 annual rings visible. Distance between rings 7 and 8 is greater compared to distance between rings 6 and 7 or 4 and 5.
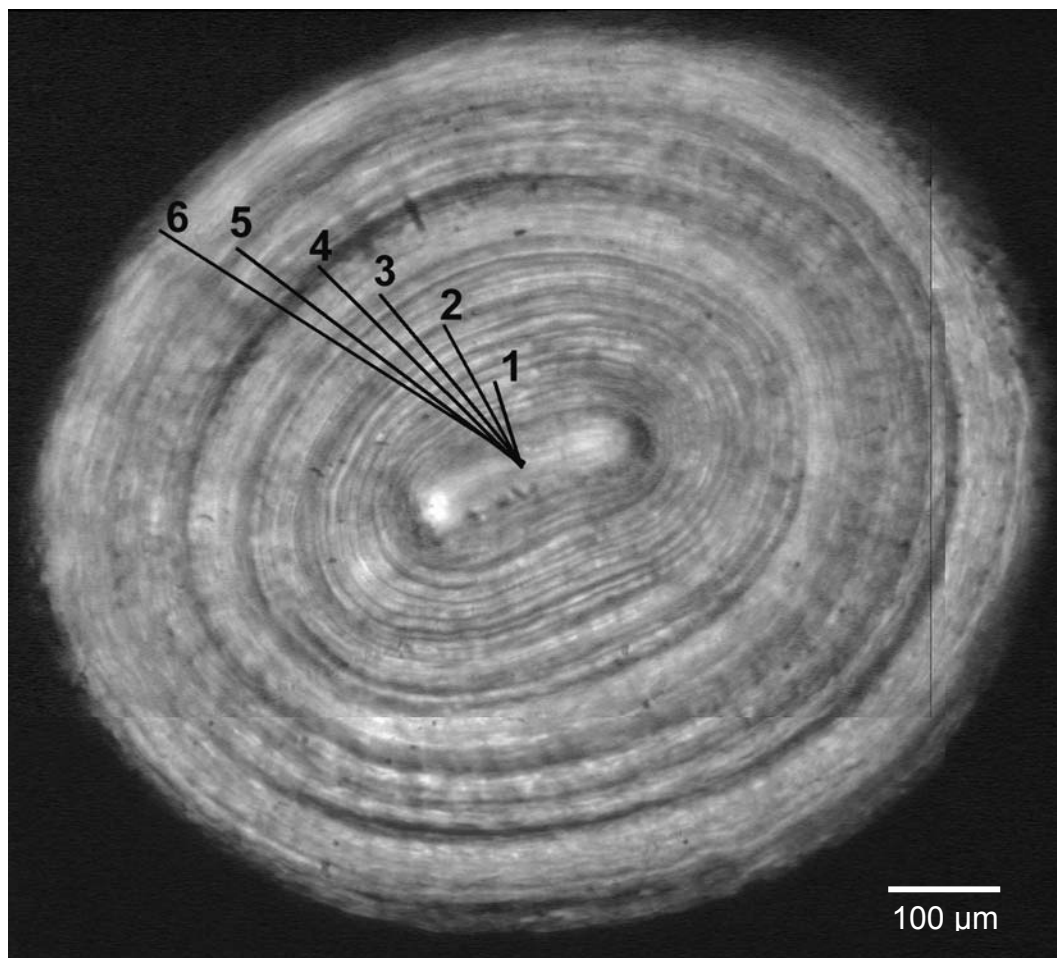
Image 5.
Lophius piscatorius from the northern collection (*Illicium* 309/5b/4) with 51 cm in length. There are 6 annual rings visible. Distances between the majority of the rings are equivalent but rings 5 and 6 are more separated compared to 3 and 4 or 2 and 3.
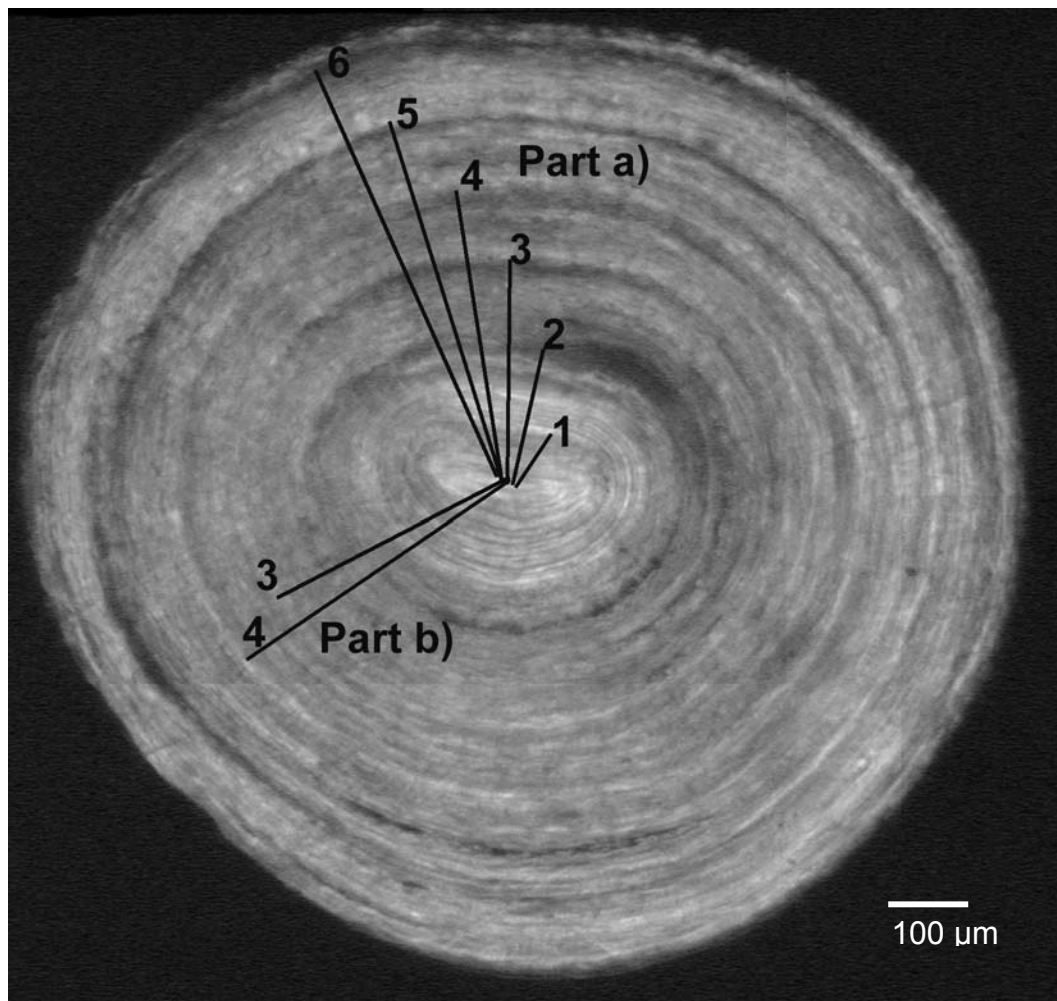
Image 6.
Lophius piscatorius from the northern collection (*Illicium* 309/5b/3) with 51 cm. There are 6 rings visible, but two distinct parts of the *illicium* are distinguishable: part a) with dark rings and part b) with bright rings. Rings 3 and 4 are dark in part a) and bright in part b).
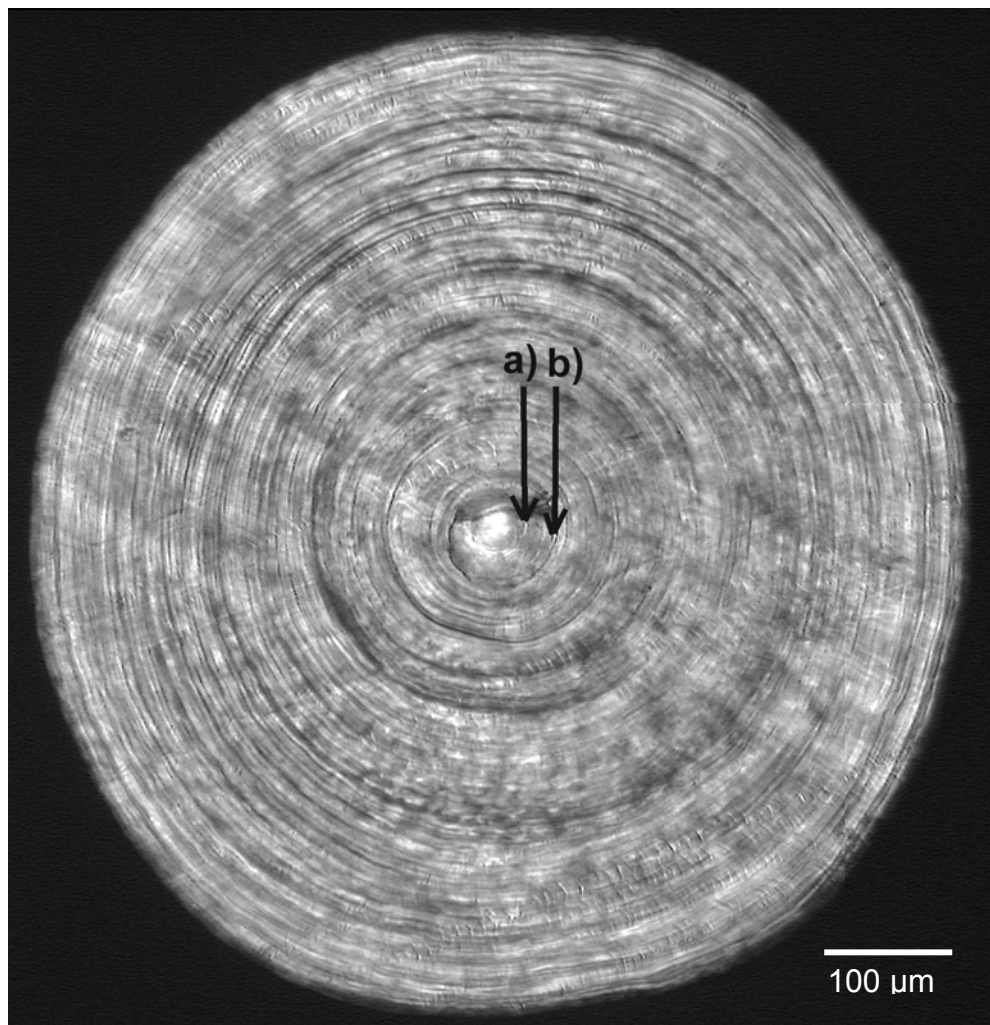
Image 7.
Lophius budegassa from the northern collection (*Illicium* 227/2b/2) with 47.9 cm in length. Benthic ring is marked as a) and first annual ring is marked as b). Annual rings are marked in Image 3. Annual rings and nucleus tend to be circular in shape, what is a characteristic of this species.
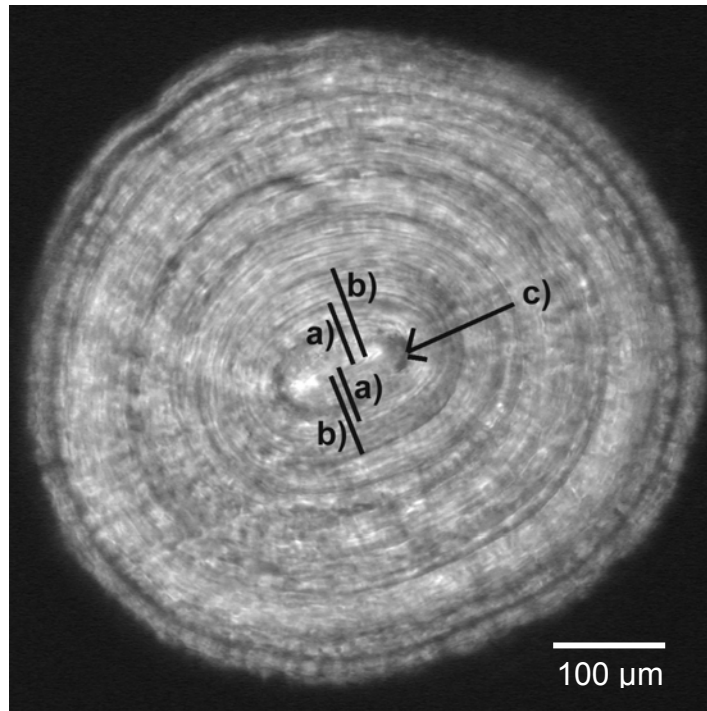
A
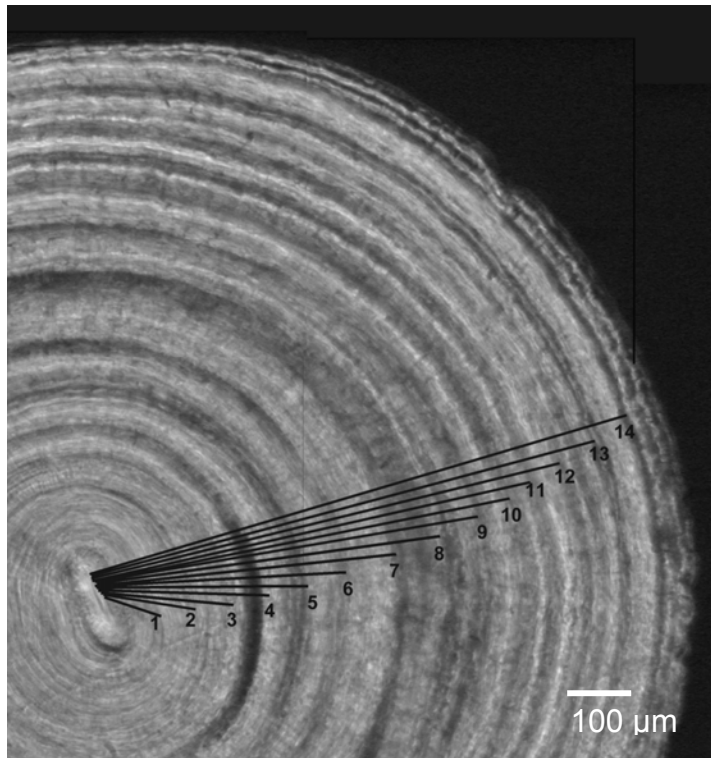
B
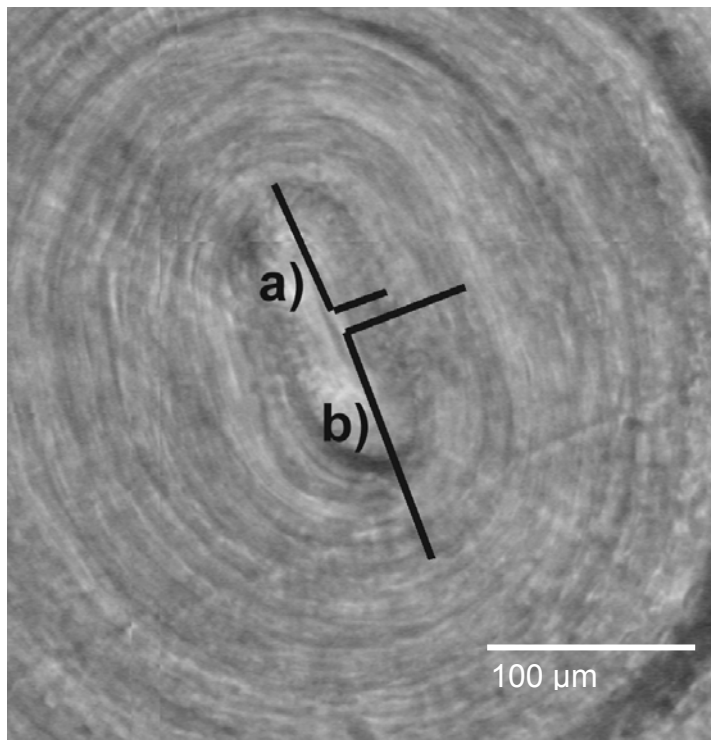
Image 8.
Lophius piscatorius from the northern collection (*Illicium* 357/4a/1) with 91 cm in length. In Image **A** are the identified annual rings (14 annual rings) and Image **B** contains for the same *illicium*, only the central part. Image **B** shows the oval shape of the first rings characteristic of this species and the benthic ring is marked as a) and the first annual ring is marked as b).
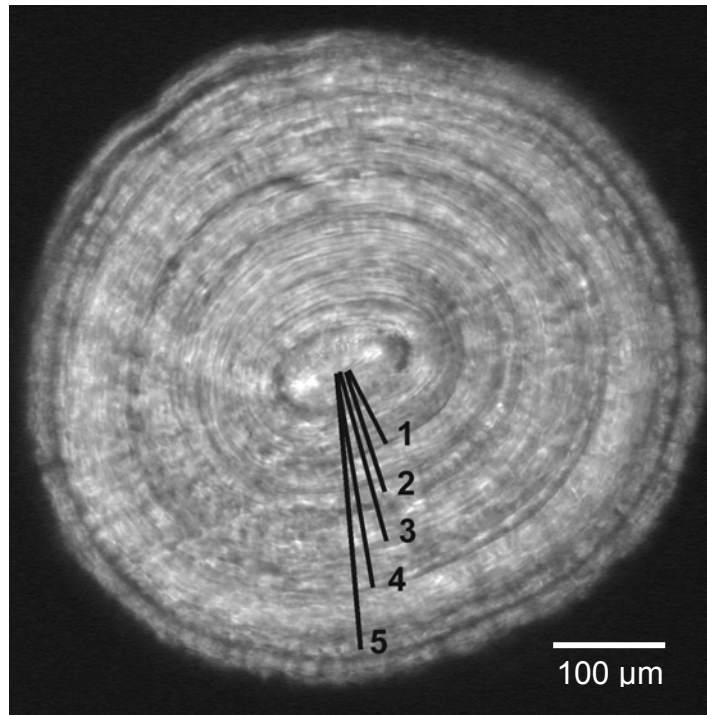
Image 9.
Lophius piscatorius from the northern collection (*Illicium* 347/4b/3) with 43 cm in length. In Image **A** are the identified annual rings (5 annual rings). In image **B** the first annual ring is marked according to the different criteria. First annual ring a) is marked by the criteria shown by R5 and R8 (smaller ring) and ring b) is marked following the criteria of R1, R6 and R7 (larger ring). All readers agreed to consider the larger ring (ring b) as the first annual. The benthic ring is marked as c).

Scanning Electron Microscopy

Iñaki Quincoces
AZTI - Sukarrieta

Objective
Comparison between Optical microscopy image and Scanning electron microscopy image.

Methods
Illicium
Lophius budegassa
Total length= ?

Illicium was first photographed using an optical microscope. After, the illicium was included in acid and photographed again using a scanning electron microscope.

Results and Conclusions
A clear contrast is visible between both images. The acid treatment corrodes the rings that are less compact and dense and the contrast between the rings is higher.

Annex 6

Guide to Anglerfish Ageing

A guide to anglerfish ageing should be produced in order to uniformize the ageing criteria for both species. It should include a protocol for the *illicia* preparation to age reading, age reading criteria and images with annual rings marked.

Till December 1999 a first version of this document should circulate between the participants in this workshop.

Rafael Duarte from IPIMAR will co-ordinate the elaboration of this ageing guide and a person from each Institute will be the contact for this purpose.

Rafael Duarte	Co-ordinator – IPIMAR - Lisbon
Iñaki Quincoces	AZTI – Sukarrieta
Jorge Landa	IEO – Santander
Hervé Dupouy	IFREMER – Lorient
Fiona Woods	MIFRC – Dublin

Annex 7

Illicium with tetracicline mark

Hervé Dupouy
IFREMER - Lorient

Species: *Lophius budegassa*

Capture and recapture data:

Capture	**Recapture**
Date: 24/04/1998	Date: 22/05/1998
Total length: 59 cm	Total length: 59 cm