Morphometric and Genetic Characteristics of Three Species of Family Serranidae from the Sudanese Red Sea Coast

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Abstract

This study was conducted to study three species of the family Serranidae, and 145 samples were collected from the central fish market between April 2019 and September 2020. the study aimed to differentiate between the two species *Cephalopholis minata* and *Cephalopholis oligosticta* of the genus *Cephalopholis* and compare them with the species *Aethaloperca rogaa* to achieve this the study combined the use of morphometric and molecular analysis, the results showed differences in the shape of the head and fins, body color, shape and color of the spots covering the body, the results of measurements also showed that the relationship between the standard length and (total length - body depth - peduncle depth - head length - snout length - the maximum length recorded in this study was 32 cm, while the minimum length was 21 cm, and the average length of the three species was 26.44 cm. the study also recorded that females reach larger morphometric measurements than males, the use of hierarchical cluster analysis of the morphological characteristics of the studied species also showed that members of *C.minata* and *C. oligosticta* they were grouped into two sister blocks indicating their association, while the members of were grouped *A. rogaa* of a separate genus, the extracted DNA was sufficient to perform the polymerase chain reaction of the three species, an estimated >600 mitochondrial cytochrome oxidase subunit I (COI) base pair regions. High-quality CO1 sequences were amplified, and only three sequences were submitted to the gene bank representing A. *rogaa*. The generated sequences were compared with the CO1 sequences published in public databases and revealed an identity of 99 - 100%. The study concluded that genetic sequencing based on traditional morphological analysis is effective for species classification, and the study recommends further studies of the genus Cephalophis and the grouper family on the Sudanese Red Sea coast using genetic sequencing along with traditional morphological analysis of their effectiveness in species classification.

المستخلص

أجريت هذه الدراسة لدراسة ثلاثة أنواع من عائلة *Serranidae* وتم جمع 145عينة لثلاثة أنواع من سوق السمك المركزي في الفترة بين أبريل 2019 وسبتمبر 2020 وهدفت الدراسة إلى التفريق بين النوعين *Cephalopholis minata* و *Cephalopholis oligosticta* من جنس Cephalopholis ومقارنتها بالنوع *Aethaloperca rogaa* لتحقيق ذلك جمعت الدراسة بين استخدام التحليل المورفومتري والجزيئي ، وأظهرت النتائج اختلافات في شكل الرأس والزعانف ولون الجسم وشكل ولون البقع التي تغطي الجسم، كما أظهرت نتائج القياسات أن العلاقة بين الطول القياسي و (الطول الكلي - عمق الجسم - عمق السويقة - طول الرأس - طول الخطم - والوزن) كانت قوية في الثلاثة أنواع وكان الحد الأقصى للطول المسجل في هذه الدراسة (32) سم ، بينما كان الحد الأدنى للطول (21) سم ، وكان متوسط الطول للثلاثة أنواع (26.44) سم كما سجلت الدراسة أن الإناث تصل إلى قياسات مورفومترية أكبر من الذكور ,أظهر استخدام التحليل العنقودي الهرمي للخصائص المورفولوجية للأنواع المدروسة أيضا أن أعضاء *C.minata* و*C. oligosticta* تم تجميعهما في كتلتين شقيقتين تشير إلى ارتباطهما ، في حين تم تجميع أعضاء *A. rogaa* من جنس منفصل, كان الحمض النووي المستخرج كافيا لأداء تفاعل البوليميراز المتسلسل للأنواع الثلاثة ، ما يقدر بـ 600 < منطقة زوج قاعدي .mitochondrial cytochrome oxidase subunit I (COI) وتم تضخيم تسلسلات CO1 عالية الجودة وتم تقديم ثلاثة تسلسلات فقط إلى بنك الجينات الذي يمثل *A. Rogaa* تمت مقارنة التسلسلات المتولدة مع تسلسلات CO1 المنشورة في قواعد البيانات العامة وكشفت عن هوية 99- 100 ٪ . وخلصت الدراسة إلى أن التسلسل الجيني القائم على التحليل المورفولوجي التقليدي فعال لتصنيف الأنواع وتوصي الدراسة بمزيد من الدراسات للجنس Cephalophlis وعائلة Grouper علي ساحل البحر الاحمر السوداني باستخدام التسلسل الجيني جنبا إلى جنب مع التحليل المورفولوجي التقليدي لفعاليتهما في تصنيف الأنواع .

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Conclusion

Morphometric classification is an excellent taxonomic tool, all the morphometric measurements taken are statistically significant, important in clarifying the value of similarity and difference of the species under study, and that most of the relationships were strong, such as the relationship of standard length with total length – weight - body depth - Head Length, the maximum recorded length in this study was 32 cm. In comparison, the minimum length was 21 cm, and the average length of the three species was 26.44 cm. The study also recorded that females reach larger morphometric measurements than males.

For the genetic part, DNA was extracted, its quality and purity were measured, and samples were sent for sequencing for Species A. Rogan and compared with samples

represented on the Red Sea coast of the gene bank. The similarity ratio is 99 – 100, and genetic classification is one of the latest and most important classification methods. It has proven its effectiveness, especially in species with morphological similarity.

Recommendations

The study recommends more studies on the Sudanese Red Sea coast regarding fish roe, which is economically important.

The study recommends more studies on the genus Cephalopholis and the species C. *miniata* and C. oligsticta in the Sudanese coast due to the possibility of the presence of a Subspecies of this Species.

- The study also recommends using genetic classification in subsequent studies because it is considered an effective tool for clarifying the difference between morphologically similar species.