

**STOCK IDENTIFICATION OF LEOPARD CORAL GROUPEL
(*Plectropomus leopardus*) AND ORANGE-SPOTTED GROUPEL
(*Epinephelus coioides*) IN SALEH BAY: IMPLICATIONS FOR
CAPTURE FISHERIES MANAGEMENT**

REGI DARMAWAN



**DOCTORAL PROGRAM OF MARINE FISHERIES TECHNOLOGY
FACULTY OF FISHERIES AND MARINE SCIENCE
IPB UNIVERSITY
BOGOR
2026**

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RINGKASAN

REGI DARMAWAN. Identifikasi Stok Kerapu Sunu Merah (*Plectropomus leopardus*) dan Kerapu Balong (*Epinephelus coioides*) di Teluk Saleh: Implikasi bagi Pengelolaan Perikanan Tangkap. *Dibimbing oleh* BUDY WIRYAWAN, ARI PURBAYANTO, IRFAN YULIANTO dan SONJA KLEINERTZ.

Delineasi stok ikan kerapu di Teluk Saleh sangat penting untuk memastikan pengelolaan perikanan yang akurat dan berkelanjutan. Saat ini, Teluk Saleh memiliki keanekaragaman spesies yang tinggi, dengan 21 spesies ikan kerapu teridentifikasi. Namun, dalam lima tahun terakhir, peningkatan aktivitas penangkapan ikan menyebabkan eksploitasi berlebih, sehingga diperlukan langkah-langkah konservasi. Penangkapan ikan kerapu dilakukan baik di dalam maupun di luar Teluk Saleh, dengan hasil tangkapan didaratkan di Pulau Sumbawa. Data penangkapan di dalam Teluk Saleh telah terdokumentasi dengan baik, tetapi informasi mengenai penangkapan di luar kawasan, seperti Pulau Sailus dan Pulau Medang, masih terbatas. Oleh karena itu, pencatatan hasil tangkapan secara menyeluruh sangat diperlukan untuk mendukung pengelolaan perikanan ke depan. Selain itu, penting untuk mengetahui apakah stok kerapu yang ditangkap di dalam dan luar Teluk Saleh berasal dari populasi yang sama atau berbeda. Jika berbeda, pengelolaan terpisah harus diterapkan untuk menjaga keberlanjutan sumber daya ikan kerapu di wilayah ini.

*Tujuan penelitian ini telah dirumuskan dan dijawab melalui beberapa tujuan utama, yaitu: (i) mengkaji karakteristik serta kondisi umum perikanan kerapu di Teluk Saleh, Nusa Tenggara Barat, Indonesia (Bab 3 dan Bab 4); (ii) mendelineasi stok kerapu sunu (*Plectropomus leopardus*) menggunakan berbagai pendekatan (morfologi, genetika, dan parasit) dengan perbandingan antara Teluk Saleh dan Pulau Sailus (Bab 5); (iii) mengidentifikasi stok kerapu balong (*Epinephelus coioides*) menggunakan DNA barcoding di Teluk Saleh, Nusa Tenggara Barat, Indonesia (Bab 6); serta (iv) mengidentifikasi stok kerapu balong (*E. coioides*) menggunakan parasit ikan di Teluk Saleh, Nusa Tenggara Barat, Indonesia (Bab 7).*

Penelitian ini mengintegrasikan berbagai pendekatan untuk memperkuat pemahaman mengenai dinamika populasi dalam perikanan kerapu di Teluk Saleh. Identifikasi stok dilakukan melalui analisis morfologi (morfometrik–meristik), genetika molekuler, dan parasit ikan. Selain itu, kondisi perikanan di Teluk Saleh dianalisis menggunakan pemodelan statistik, yang mencakup indeks keanekaragaman, parameter biologi ikan, tingkat eksploitasi, serta faktor-faktor yang memengaruhi Catch Per Unit Effort (CPUE) dengan menggunakan Generalized Linear Models (GLMs). Hasil penelitian ini diharapkan memberikan informasi yang bernilai terkait status stok kerapu dan kondisi lingkungan di Teluk Saleh, yang selanjutnya dapat menjadi dasar dalam penyusunan strategi pengelolaan perikanan yang berkelanjutan di masa depan.

*Dengan mengintegrasikan bukti morfometrik, genetik, dan parasitologi, penelitian ini menunjukkan adanya diferensiasi stok yang konsisten antara Teluk Saleh dan perairan perbandingan di sekitarnya. Pada kerapu sunu (*P. leopardus*), analisis diskriminasi morfometrik memperlihatkan pemisahan yang jelas antara individu dari Teluk Saleh dan Pulau Sailus, yang juga disertai perbedaan pola pertumbuhan pada kedua lokasi tersebut. Temuan ini diperkuat oleh analisis*

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genetik yang mengindikasikan segregasi pada tingkat subpopulasi di antara kedua lokasi. Pola parasitologi turut mendukung diferensiasi tersebut: komunitas endoparasit berbeda secara nyata baik dalam komposisi maupun kelimpahan, dan perbedaan ini sejalan dengan variasi isi lambung, yang mengisyaratkan adanya heterogenitas spasial dalam sumber pakan dan dinamika trofik. Pada kerapu balong (*E. coioides*), indikasi struktur populasi lokal ditunjukkan oleh hasil DNA barcoding yang menempatkan individu dari Teluk Saleh dalam klaster geografis yang berbeda. Hal ini konsisten dengan hasil parasitologi, yang menunjukkan bahwa komunitas parasit pada *E. coioides* di Teluk Saleh membentuk kelompok tersendiri dibandingkan perairan lainnya. Dengan demikian, berdasarkan tiga pendekatan tersebut, terdapat dukungan kuat bahwa populasi *P. leopardus* dan *E. coioides* di Teluk Saleh merupakan unit stok yang mandiri. Oleh karena itu, intervensi pengelolaan di Teluk Saleh diperkirakan akan lebih efektif apabila diterapkan melalui kerangka pengelolaan berbasis ruang yang memperlakukan Teluk Saleh sebagai unit pengelolaan tersendiri guna meningkatkan keberlanjutan perikanan kerapu.

Penelitian lanjutan perlu memprioritaskan perluasan cakupan sampling spasial-temporal, penerapan genomik populasi beresolusi tinggi, pemanfaatan penanda berbasis otolit, serta penyempurnaan indikator parasit untuk memvalidasi batas stok dan menjelaskan mekanisme diferensiasi. Integrasi kajian ekologi pergerakan, dinamika reproduksi, dan studi trofik akan membantu memperjelas konektivitas demografis serta tingkat kementapan (*local residency*) populasi. Terakhir, penerjemahan informasi struktur stok ke dalam evaluasi strategi pengelolaan (*management strategy evaluation*), yang didukung oleh penilaian sosial-ekonomi, akan memungkinkan Teluk Saleh dikelola secara efektif sebagai unit pengelolaan berbasis ruang demi keberlanjutan perikanan kerapu.

Kata kunci: DNA Barcoding, Identifikasi Stok, Morfologi (morfometrik-meristik), Parasit Ikan, Pengelolaan Perikanan

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SUMMARY

REGI DARMAWAN. Stock Identification of Leopard Coral Grouper (*Plectropomus leopardus*) and Orange-Spotted Grouper (*Epinephelus coioides*) IN Saleh Bay: Implications for Capture Fisheries Management. Supervised by BUDY WIRYAWAN, ARI PURBAYANTO, IRFAN YULIANTO and SONJA KLEINERTZ.

The delineation of grouper stocks in Saleh Bay is crucial for ensuring accurate and sustainable fisheries management. Currently, Saleh Bay exhibits high species diversity, with 21 grouper species identified. However, over the past five years, increased fishing activity has led to overexploitation, necessitating conservation measures. Grouper fishing takes place both inside and outside Saleh Bay, with the catches being landed in Sumbawa Island. While data on fishing activities inside Saleh Bay are well documented, information regarding fishing outside the bay, such as in Sailus Island and Medang Island, remains limited. Therefore, comprehensive catch recording is essential for future fisheries management. Additionally, it is important to determine whether the grouper stocks caught inside and outside Saleh Bay belong to the same population or are distinct. If they are separate populations, differentiated management strategies must be implemented to ensure the sustainability of grouper resources in the region.

The objectives of this study have been addressed to assess characteristics and general condition of grouper fisheries in Saleh Bay, West Nusa Tenggara, Indonesia (chapter 3 and chapter 4), to delineate the stock of leopard coral grouper (*P. leopardus*) using various methods (morphology, fish parasite, and molecular genetics) between Saleh Bay and Sailus Island (chapter 5), to identify the stock of the orange-spotted grouper (*E. coioides*) using DNA barcoding in Saleh Bay, West Nusa Tenggara, Indonesia (chapter 6), and to identify stock of orange-spotted grouper (*E. coioides*) using fish parasites in Saleh Bay, West Nusa Tenggara, Indonesia (chapter 7).

This study integrates multiple approaches to better understand the population dynamics of grouper fisheries in Saleh Bay. Stock identification is conducted through morphological analyses (morphometric-meristic), molecular genetics, and fish parasites. Additionally, fisheries conditions in Saleh Bay are examined using statistical modelling, including diversity indices, fish biological parameters, exploitation levels, and factors affecting *Catch Per Unit Effort* (CPUE) using Generalized Linear Models (GLMs). The findings of this research are expected to provide valuable insights into the status of grouper stocks and the environmental conditions in Saleh Bay. This information can serve as the foundation for developing sustainable fisheries management strategies for the future.

By integrating morphometric, molecular genetics, and parasitological evidence, this study demonstrates consistent stock differentiation between Saleh Bay and adjacent comparison waters. For *Plectropomus leopardus*, morphometric discrimination indicates pronounced separation between specimens from Saleh Bay and Sailus Island, accompanied by different growth patterns both of localities. These findings are substantiated by genetic analyses, which reveal subpopulation-level segregation between the two localities. Parasitological patterns further support this differentiation: endoparasite assemblages differ markedly in both composition and abundance, and these differences correspond with variation in stomach

contents, implying spatial heterogeneity in prey resources and trophic dynamics. In *Epinephelus coioides*, evidence for localized population structure is indicated by DNA barcoding, which places Saleh Bay individuals within a distinct geographic cluster. This signal is consistent with parasitological results showing that parasite communities in Saleh Bay form a discrete assemblage relative to those observed in other waters. Therefore, based on three approaches provides support for recognizing Saleh Bay populations of *P. leopardus* and *E. coioides* as distinct stock units. Consequently, management interventions in Saleh Bay may be most effective when implemented under a spatially explicit framework that treats the Saleh Bay as an independent management unit to improve sustainable grouper fisheries management.

Future research should prioritize broader spatiotemporal sampling, high-resolution population genomics, otolith-based tracers, and refined parasite indicators to validate stock boundaries and mechanisms of differentiation. Integrating movement ecology, reproductive dynamics, and trophic studies will clarify demographic connectivity and local residency. Finally, implementing stock structure into management strategy evaluation supported by socioeconomic assessments will enable Saleh Bay to be managed as an effective, spatially explicit unit for long-term grouper fisheries sustainability.

Keywords: DNA Barcoding, Fish Parasite, Fisheries Management, Morphology (morphometric-meristic), Stock Identification

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(*Epinephelus coioides*) IN SALEH BAY: IMPLICATIONS FOR
CAPTURE FISHERIES MANAGEMENT**

REGI DARMAWAN

Dissertation
Submitted in partial fulfillment of the requirements for The
Degree of Doctor
at
Marine Fisheries Technology Study Program

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External Examiner in the Dissertation Closed Examination:

- 1 Dr. Ir. Muhammad Fedi Alfiadi Sondita, M.Sc
- 2 Dr. Heidi Retnoningtyas, S.Pi, M.Si

External Promoter in the Dissertation Open Promotion:

- 1 Dr. Ir. Muhammad Fedi Alfiadi Sondita, M.Sc
- 2 Dr. Heidi Retnoningtyas, S.Pi, M.Si

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Name : Regi Darmawan
Student ID : C4603201008

Approved by

Chairman of Supervisory Commission:
Prof. Dr. Ir. Budy Wiryawan, M.Sc



Member of Supervisory Commission:
Prof. Dr. Ir. Ari Purbayanto, M.Sc



Member of supervisory Commission:
Dr. Irfan Yulianto, S.Pi., M.Si



Member of Supervisory Commission:
Dr. rer. nat. habil. Sonja Kleinertz

S. Kleinertz

Known by

Head of Marine Fisheries Technology Study Program:
Prof. Dr. Ir. Ronny Irawan Wahju, M.Phil
NIP 19610906198703 1 002



Dean of Faculty of Fisheries and Marine Science:
Dr. Beginer Subhan, S.Pi., M.Si
NIP 19800118 200501 1 003



Date of close defense examination: June, 5th 2025
Date of doctoral promotion: January 14th, 2026

Graduation date:

FOREWORD

Praise and gratitude are due to Allah subhanaahu wa ta'ala for all His gifts so that this scientific work can be successfully completed. The theme chosen in this research, which was carried out from April 2021 to September 2024, is about stock identification in grouper fisheries, with the title “Stock Identification of Leopard Coral Grouper (*Plectropomus leopardus*) and Orange-Spotted Grouper (*Epinephelus coioides*) in Saleh Bay: Implications for Capture Fisheries Management”.

I would like to express my deepest gratitude to several individuals who have been instrumental in the completion of this dissertation.

1. First and foremost, my heartfelt thanks go to Prof. Budy Wiryawan, Prof. Ari Purbayanto, Dr. Irfan Yulianto, and Dr. Sonja Kleinertz for their invaluable guidance, support, and encouragement throughout this study. Their expertise and insights have greatly enriched my research.
2. I am also immensely grateful to Dr. Am Azbas Taurusman, Dr. Muhammad Fedi Alfiadi Sondita, and Dr. Heidi Retnoningtyas as reviewers for their constructive comments and suggestions, which have significantly improved the quality of this dissertation.
3. Special thanks to the lecturers of the Fisheries Resource Utilization program for their dedication and for imparting their knowledge, which has been fundamental to my academic growth.
4. I would like thanks to Ministry of Education, Culture, Research and Technology of the Republic of Indonesia through Master Program Leading to Doctoral Degree for Outstanding Students or PMDSU Scholarship Program.
5. I would like to extend my appreciation to the PMDSU V IPB awardees for their camaraderie and support.
6. I would like to extend my appreciation to the TPL 57 doctoral program for their camaraderie and support.
7. I would like thanks to Rekam Nusantara Foundation-Fisheries Resource Center of Indonesia, Wildlife Conservation Society, and FIP2B who have helped and facilitated during this research.
8. Lastly, I am profoundly thankful to my family for their unwavering love, patience, and encouragement. Their support has been my pillar of strength throughout this endeavor.

Hopefully this scientific work will be useful for those who need it and for the advancement of science.

Bogor, February 2026

Regi Darmawan

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