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High-quality Development Path of Graduate Education in Aquaculture Discipline: A Case Study of Guangdong Ocean University

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Abstract Aquaculture is a discipline system that focuses on exploring the growth, development, reproduction, aquaculture, and resources of aquatic animals and plants, and their complex relationships. Under the tide of the "high-quality development" strategy, the aquaculture discipline is also facing new opportunities and challenges for transformation, upgrading, and deepening development. Therefore, exploring and practicing an effective path for the high-quality development of graduate education in aquaculture is not only the key to promoting the transformation of graduate education in aquaculture from scale expansion to quality improvement, but also has immeasurable value for implementing the strategy on developing a quality workforce and the strategy of scientific and technological powerhouse. The high-quality development of graduate education in aquaculture can be promoted from the following aspects: optimizing and improving the construction of the graduate education system, focusing on enhancing the quality of high-level talent cultivation, strengthening the overall strength of the graduate supervisor team, actively promoting the adjustment and upgrading of the disciplinary and professional structure, strengthening the construction of resource platforms and deepening the implementation of collaborative education mechanisms, and continuously expanding and deepening the new pattern of international exchange and cooperation. Through the comprehensive promotion of the above paths, the aim is to fully build a model for the improvement and governance of graduate education quality.

Key words Aquaculture, Graduate education, High-quality development

1 Introduction

In the process of national modernization, China's economy has gradually moved towards a stage of high-quality development. Back to July 2020, General Secretary Xi Jinping clearly pointed out that graduate education not only undertakes the responsibility of cultivating innovative talents, but also shoulders the important mission of enhancing innovation capabilities. In addition, it also plays a core role in serving economic and social development, promoting the modernization of the national governance system and capacity, and other aspects[1]. As a discipline that focuses on the growth, development, reproduction, aquaculture, resources of aquatic animals and plants, and their complex relationships[2], the aquaculture discipline has also been deeply influenced by the "high-quality development" strategy. This strategy has injected new impetus and opportunities for upgrading and development of the aquaculture discipline, while it also brings unprecedented challenges and problems urgently to be solved. Therefore, in-depth exploration and realization of the path for high-quality development of graduate education in the field of aquaculture is of great significance for promoting the leapfrog transformation of graduate education in the field of aquaculture from large to strong, and further promoting the deep implementation of the strategy on developing a quality workforce and the strategy of scientific and technological powerhouse.

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2 Challenges in the development of high-quality graduate education in the field of aquaculture

In the journey of achieving the second centenary goal of China, high-quality graduate education plays an indispensable foundational and fundamental supporting role[3]. In order to promote the continuous progress of education in this field, it is necessary to adopt systematic and targeted training methods based on the growth rules of high-level talents, the actual needs of the country and society, and the training objectives of graduate students, to promote graduates' comprehensive physical and mental development, and focus on enhancing their innovation ability. However, on the path towards high-quality graduate education in the aquaculture discipline of Guangdong Ocean University, there are still several key issues urgently to be addressed.

2.1 Balance between the quality of graduate student sources and the development goals of high-quality education As a part of agriculture, there are relatively few educational institutions with the aquaculture discipline in Guangdong Province, presenting significant characteristics of unpopular disciplines. With the booming development of the aquaculture industry, the demand for undergraduate talents has surged, resulting in a relatively scarce number of candidates taking the postgraduate entrance exam in this

major. In addition, the field of aquaculture is often seen as a relatively challenging discipline, and many students tend to choose universities included into the "Double First Class" initiative when taking postgraduate entrance exam. Therefore, about half of the graduate students in the fisheries department of Guangdong Ocean University are admitted through adjustment, which directly leads to a shortage of students and uneven quality, posing a significant constraint on the improvement of graduate education quality[4].

2.2 Conflict between monotonous training programs and diversified demand for industrial talents Since the 18th National Congress of the Communist Party of China, China's aquaculture industry has continuously practiced the path of ecological and intelligent development, such as the promotion of multi nutrient hierarchical three-dimensional aquaculture models, and the widespread application of IoT aquaculture equipment and large-scale deep-sea aquaculture equipment. Meanwhile, inspection and quarantine work is also steadily advancing. However, the current training program for aquaculture disciplines is still too limited to imparting knowledge in this field. Despite closely related to biology, it has not fully integrated the cross disciplinary integration of engineering, information, economics, and other disciplines. This has led to the difficulty of cultivating talents that can fully meet the diversified needs of the industry, and limited employment channels[5]. In the context of high-quality development, the industry has increasingly high requirements for the comprehensive quality, interdisciplinary knowledge, and multi technical abilities of talents. Therefore, there is an urgent need to reconstruct and optimize the curriculum system and training programs.

2.3 Mismatch between the lagging construction of the supervisor team and the demand for cultivating students' innovative abilities Supervisors play a crucial role in graduate education, not only as guides on the path of scientific research, but also as role models of academic ethics and enlighteners of ideas. However, some graduate supervisors currently do not meet the high standards required for graduate education in terms of comprehensive qualities. Some supervisors have a mentality of seeking quick success and instant benefits, lacking self-restraint in academic integrity and morality, and failing to fully fulfill their responsibilities of cultivating virtue and effectively guide graduate students to abide by academic ethics and norms[6].

2.4 Contradiction between the demand for high-quality educational resources and the insufficient construction of resource platforms Graduate education is a high-cost talent cultivation project that requires continuous investment of abundant resources and the establishment of a comprehensive educational resource platform to provide solid support. Although the fisheries department of Guangdong Ocean University has a long history, and multiple provincial and departmental scientific research platforms have been built, it still does not have a national level research platform, which greatly limits the development potential and influence of the discipline and cannot meet the increasing demand for high-quality resources in graduate education[7].

2.5 Gap between the limited level of international exchange and cooperation and the requirements for international industrial development Comprehensive opening up is valuable experience for China to achieve leapfrog development, and it is also an important driving force for promoting the modernization process. General Secretary Xi Jinping has repeatedly emphasized that China should continue to promote reform, development, and innovation through opening up, and continuously improve the level of opening up to the outside world. In this context, strengthening international exchanges and cooperation has become an inevitable choice to promote the high-quality development of graduate education. However, the overall level of international exchange and cooperation in the aquaculture discipline of Guangdong Ocean University still needs to be improved, and substantial cooperation projects and major research projects still need to be further expanded and deepened[8].

3 High-quality development path of graduate education in aquaculture discipline

3.1 Research ideas By optimizing and improving the graduate education system, significantly enhancing the quality of high-level talent cultivation, comprehensively strengthening the construction of graduate supervisor teams, actively promoting the adjustment and upgrading of disciplinary and professional structures, accelerating the construction of resource platforms and implementing collaborative education strategies, and continuously deepening international cooperation and exchanges to create new situations, it is committed to building and shaping exemplary cases of graduate education quality improvement and governance.

3.2 Main research methods

3.2.1 Implementing high-quality student source project. (i) Deeply tapping into the source of students from Guangdong Ocean University, while actively expanding the source of students from other schools. A comprehensive plan to enhance undergraduate research talents should be implemented. Firstly, it should launch a laboratory program for undergraduate students to cultivate their research abilities in advance. Secondly, it should organize various subject competitions (such as aquaculture skills competition, ecological fish tank landscaping competition, *etc.*) to enhance undergraduate students' recognition and love for their majors, and comprehensively improve their scientific research literacy. Finally, by organizing various forms such as graduate student forums, summer schools, and practice contests, it should actively strive for "recommended students" (outstanding undergraduate graduates recommended to study for master's degree not needing taking exam) and increase the proportion of first choice students applying.

(ii) Relying on important scientific research projects, and increasing the intensity of awards and assistance. It should fully utilize important scientific research project resources at the nation-

al, provincial, and ministerial levels, and significantly increase the rewards and funding for graduate students. Specific measures include establishing special scholarships for freshmen, college scholarships, supervisorship grants, enterprise scholarships, *etc.*, to attract more outstanding undergraduate students to apply.

(iii) Utilizing disciplinary characteristics and advantages to attract high-quality students through multiple online and offline channels. It should carry out diversified enrollment promotion work both on and off campus, and dispatch professional teachers with industry influence to conduct enrollment presentations in various places. At the same time, it should make full use of online channels (such as live streaming) for enrollment promotion, and fully leverage the promotional role of diverse entities such as college leaders, department cadres, supervisors, counselors and class teachers, and current graduate students.

(iv) Seizing the opportunity of the "the Belt and Road" initiative, and expanding the enrollment of international students from countries along the road. It should actively respond to and seize the opportunities brought by the "the Belt and Road" initiative, and strive to expand the enrollment of foreign students from countries along the line by formulating targeted enrollment policies and measures.

3.2.2 Optimizing and improving the graduate education system, and enhancing the quality of high-level talent cultivation. (i) Guided by ideological and political education, achieving the dual integration and advancement of moral education and professional development. Firstly, it should strengthen patriotic education for graduate students, and enhance their sense of national ownership and responsibility. Secondly, it must adhere to the leading role of the Party throughout the training of graduate students, and adopt a dual promotion and dual advancement model of "Party building + discipline and major". Thirdly, it should vigorously promote the construction of ideological and political education in the curriculum, achieving a deep integration and enhancement of ideological and political, knowledge, and ability values.

(ii) Promoting diversified and integrated development, and impelling the cross integration of aquaculture disciplines and emerging disciplines. It should deeply transform and upgrade the aquaculture discipline in the context of high-quality development; serve the development needs of new business models and focus on major issues such as aquatic food safety and sustainable development; break down inherent disciplinary boundaries and professional barriers; promote the integration of innovative development in fields such as system science, information technology, and biotechnology; resolve issues such as narrow professional scope and single mode.

(iii) Enhancing service capabilities to meet the needs of regional economic and social development. It should accelerate the transfer and transformation process of scientific research achievements; improve the ability and level of serving regional economy; lead the technological progress and transformation upgrading of the aquaculture industry; promote fishermen's income increase and serve strategic tasks such as national poverty alleviation and construction of beautiful rurals; establish a technology and talent training base for the aquaculture and marine industries in the core cities of the Guangdong – Hong Kong – Macao Greater Bay Area; actively integrate into the overall construction of the Greater Bay Area.

(iv) Developing a training program centered on the development of distinctive connotations. Based on the characteristics of aquaculture discipline and the establishment of research teams, it should improve and update the graduate training program; highlight the characteristics of modern fisheries in the South China Sea; establish a high-quality fishery talent training system that complements the advantages of fish, shrimp, shellfish, algae, nutrition, disease prevention and control, fishery resources, biotechnology, and fishery ecology.

(v) Establishing a sound academic misconduct supervision system. It should implement the "one vote veto" system for academic misconduct; promote the moral standards of the academic community through various forms such as daily publicity and education, guidance from supervisors, and special lectures; establish a three-tier supervision system consisting of schools, colleges, and supervisors, and implement a system for detecting academic misconduct and conducting blind review of academic theses and dissertations; improve the quality of academic papers and maintain a good academic atmosphere.

3.2.3 Building a high-level supervisor team. (i) Establishing a supervisor group based on the scientific research team. For the insufficient academic background of some students, a multi-supervisor system for graduate education is adopted to ensure that students receive comprehensive and in-depth guidance and support.

(ii) Building a high-level supervisor team that emphasizes both scientific research and ethics. It should emphasize the dual standards of professional competence and ethical standards of the supervisor team; strictly monitor and strengthen the evaluation of the research level and academic ethics of supervisors during the selection process. At the same time, regular supervisor training activities are conducted to enhance their awareness of the main responsibility of cultivating morality and talent, and create a good atmosphere of promoting research through morality.

3.2.4 Promoting the construction of resource platforms and implementing collaborative education strategies. By building diversified development platforms such as information sharing platforms, collaborative innovation center platforms, and key laboratories, the main body of graduate education is encouraged to actively participate in scientific research on diverse platforms, fully demonstrate their talents, and jointly promote the birth of cutting-edge scientific research achievements. It should strengthen the standardized management of professional graduate students. Considering that aquaculture joint training bases are mainly located in remote and seaside farms, students need to participate in scientific re-

search work at the bases for a long time. Therefore, enterprise supervisors should shoulder more responsibility for student management, ensure that students' safety education is put in place, strictly implement attendance and assessment systems to ensure the quality and effectiveness of graduate education.

3.2.5 Focusing on the goal of first-class discipline, and deepening the international exchange and cooperation of graduate education in a new chapter. To support the construction of a strong aquatic science and technology country and a highland of innovative talents, around the grand goal of world-class aquatic disciplines, it should regard international development as the core driving force and strategic direction for the high-quality development of graduate education. In various aspects such as educational philosophy, discipline construction, enrollment and training, faculty team, and academic atmosphere, it should deepen openness and cooperation, continuously expand international perspectives, and promote high-quality development in the field of aquaculture. With the goal of cultivating high-level talents with a global perspective and international competitiveness, familiarity with international rules, it is necessary to continuously optimize the discipline structure and degree education system.

Specific measures include: firstly, increasing the internationalization ratio of the supervisor team by supporting supervisors to study abroad, work in international organizations, offer bilingual courses, and hold important positions in international journals. Secondly, it should collaborate with high-level universities and research institutions overseas to jointly develop high-quality international courses through online education platforms. Thirdly, it should increase efforts to support graduate students, especially doctoral students, to participate in international academic and research exchanges, and provide them with valuable opportunities to participate in international projects and intern at international organizations.

4 Conclusions

4.1 Innovation points of research Under the framework of high-quality development, it is committed to building an advanced and reasonable training mechanism through a series of systematic measures, including optimizing and improving the graduate education system, energetically enhancing the quality of high-level talent cultivation, comprehensively strengthening the construction of graduate supervisor teams, actively accelerating the adjustment and upgrading of disciplinary and professional structures, vigorously promoting the construction of resource platforms and the deepening implementation of collaborative education mechanisms, and continuously innovating and expanding new situations of international exchange and cooperation. This mechanism aims to inject strong impetus into the high-quality development of fisheries in the South China Sea region, cultivate and deliver innovative high-end talents with excellent ideological quality, comprehensive fisheries knowledge, and broad international perspectives.

4.2 Application and promotion value of research Guided by the concept of high-quality development, a series of specific and effective measures have been taken, including deepening the reform of graduate education, improving the level and quality of talent cultivation, strengthening the construction and management of supervisor teams, accelerating the transformation and upgrading of disciplines and majors, promoting the optimization of resource platform allocation and in-depth practice of collaborative education, and actively expanding new fields of international exchange and cooperation, in order to explore and construct a new model for high-quality graduate education in aquatic science. This model not only fully integrates multiple key abilities for high-level talents into the entire process of talent cultivation, but also emphasizes the cultivation of innovative abilities to fully meet the urgent demand for high-level talents in modern aquaculture industry. In addition, this model also has important application and promotion value. It can provide solid talent support and intellectual guarantee for the implementation of the rural revitalization strategy in the South China Sea region.

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