

# Implications of the Gaia Hypothesis for Marine Environmental Education

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**Abstract:** The main crises facing the marine environment at present include: (1) overfishing, (2) inappropriate aquaculture fisheries. (2) Inappropriate aquaculture fisheries. (3) Garbage. (4) Dead Zones caused by eutrophication. Gaia hypothesis attaches great importance to the coasts, marshes, and wetlands of the coastal areas. Gaia hypothesis considers the co-evolution of the environment and life from the perspective of the Earth as a whole, and includes two features: life changes the Earth's environment, and the Earth's environment, as modified by the evolution of life. The microorganisms of the coastal zone, as well as those of the oceans, participate in and drive the evolution of life. Therefore, it is important to incorporate coastal areas, marshes, wetlands into the marine environment. We need to incorporate into our marine environmental education and make it a priority in our conservation efforts.

**Keywords:** Gaia hypothesis; Environmental Ethics; Marine environmental education

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## Introduction

In 1969, J E. Lovelock proposed the "Gaia hypothesis". This theory suggests that the environment and life co-evolved, and includes two features: life changes the Earth's environment, and the changed Earth's environment drives the evolution of life. This process of mutual influence has combined life and the Earth's environment into a 'living thing', which Lovelock emphasizes as 'the Earth is a self-regulating organism' rather than 'life being forced by the environment to adjust itself in order to survive'. This living creature is called "Gaia," from the Greek word for "goddess of the earth," "mother earth". "The Gaia hypothesis has had a great impact on marine environmental education and has made coastal areas, marshes, and wetlands a priority in our environmental protection efforts. <sup>[1]</sup>

## 1. Major crises currently facing the marine environment

The main crises facing the marine environment at present include: (1) overfishing, (2) inappropriate aquaculture fisheries. (2) Inappropriate aquaculture fisheries. (3) Garbage. (4) Dead Zones caused by eutrophication.

(1) Overfishing. The Food and Agriculture Organization of the United Nations (FAO) estimates that more than 70% of the world's fish species have been fished out and depleted. Fishing has seriously jeopardized the entire marine ecosystem, and the food chain between predator and prey species has been disrupted.

(2) Inappropriate aquaculture fisheries. Because of the decrease in wild fish catch, the aquaculture industry has become more developed. However, improper management has led to many negative consequences. Aquaculture feeds, aquatic faeces, and chemicals (including antibiotics, anti-inflammatory drugs, and detergents) can easily flow into the open ocean and affect the marine ecosystem.

(3) Rubbish. This is a common problem. Marine life can easily get entangled or trapped in human garbage, and beautiful corals and sponges can be destroyed. Even worse, plastic bags can be swallowed by marine life, causing them to suffocate or blocking their digestive system.

(4) Dead Zones caused by eutrophication. Marine Dead Zones are areas where organisms cannot survive due to lack of oxygen on the seabed. These zones are often located at the mouths of large rivers, which are eutrophied because of too much human-generated nutrients brought by the river water.

## 2. Gaia hypothesis

J E. Lovelock formulated the Gaia hypothesis in 1969, and *Gaia, Mother Earth* was published in 1979; it was rewritten in 1988 as *The Ages of Gaia: a biography of our living earth*.<sup>[1]</sup>

This theory suggests that the environment and life have co-evolved and includes two features: life changes the Earth's environment, and the changed Earth's environment drives the evolution of life. This process of mutual influence has combined life and the Earth's environment into a 'living thing', which Lovelock emphasizes as 'the Earth is a self-regulating organism', rather than 'life being forced by the environment to adjust itself in order to survive'. This living creature is called "Gaia", from the Greek "Goddess of the Earth", "Mother Earth".<sup>[1]</sup>

This theory assumes that the physical and chemical environment of the Earth's surface, such as the atmosphere and oceans, is stabilized by the presence of life in such a way that it is comfortable for life. This is contrary to conventional knowledge, which suggests that life adapted to the Earth's environment and then evolved separately from it; furthermore, the Mother Earth hypothesis focuses specifically on microorganisms that are largely ignored.<sup>[2]</sup>

## 3. Characteristics of the Three Principles of the Gaia hypothesis

Gaia hypothesis Under the assumption of the existence of Mother Earth, there are three main features of the Earth's ecosystem that improve the sympathetic interaction between humans and the rest of the biosphere:<sup>[2]</sup>

(1) stabilization of all terrestrial organisms

The most important characteristic of Mother Earth is the tendency to maintain all terrestrial life in a state of stability. As long as mankind has not seriously disturbed the stability of Mother Earth's internal environment, this tendency will dominate the earth, just as it dominated the earth before the advent of man.

(2) The Gaia hypothesis is centered on many vital organs

The pivot of Mother Earth lies in the many organs that are full of life force, and around them are many organs that can be absorbed and released. The effect that mankind exerts on the Earth depends on where he exerts himself on the Earth.

(3) The Gaia hypothesis obeys the laws of system regulation

Mother Earth's worst reactions to earth changes must obey the laws of system regulation, of which time constants and loop gains are two important factors. The time constant of oxygen regulation is measured in thousands of years. This slow, time-consuming process does not easily give warning of harmful trends. By the time deterioration is recognized and action is taken, the situation is exacerbated by the resistance of stagnant inertia before any slow improvement can be introduced.

In the Gaia hypothesis, evolution continues to follow Darwin's theory of natural selection, with the goal of maintaining the best possible conditions for life in any environment.

## 4. The organ of the Gaia hypothesis

The vital organs of the Gaia hypothesis include "the silt of the harbor, wetlands, and continental shelters" and "the contents of the stomachs and intestines of us and other animals":<sup>[2]</sup>

(1) The vital organs of Mother Earth are found in the silt of harbors, wetlands and land sheds. The vital organs of Mother Earth are not found on land, but in the silt of harbors, wetlands and continental shelters. The rate at which these waters bury carbon automatically regulates the concentration of oxygen in the atmosphere, allowing many vitamins to return to the atmosphere. Therefore, unless one understands the earth and the functions these waters play, it is best to stay out of the development zone.

(2) The vital organs of Mother Earth are in the stomach and intestines of us and other animals. Methane production may be extremely important in regulating oxygen concentration, but some communities of anaerobic microorganisms (anaerobic microorganisms release methane into the atmosphere) do not live on the seafloor, but in the gastrointestinal tracts of us and other animals. Almost all of the methane is probably produced in these places. Thus, the methane and other gases produced in our stomachs and intestines may have been important, and at one time humans were slowly contributing to Mother Earth's life support system.

## 5. Differences between The Gaia hypothesis and Ecology

The Gaia hypothesis differs from ecology in that it focuses on the role of "microorganisms". The Gaia hypothesis differs from ecology in the following ways:<sup>[2][3]</sup>

(1) The Gaia hypothesis focuses on "microorganisms" that most people ignore; the origin of the Gaia hypothesis is the observation of the atmosphere and other inorganic features; and it focuses on a part of the atmosphere that most people ignore: microorganisms. The Gaia hypothesis originated from the observation of the atmosphere and other inorganic features.

(2) Another difference between the concept of Mother Earth and the concept of ecology is the history of the development of the two: The Gaia hypothesis originated from a space view of the earth, focusing on the whole of the earth and not on its details. Ecology is rooted in the natural history of the Earth's localized areas, studying habitats and ecosystems in detail.

(3) The Gaia hypothesis obeys the law of system regulation. All species more or less always improve their environment in order to achieve the optimal rate of reproduction. Mother Earth then carries out various improvement processes covering all species, and in a cyclical association of species, produces gases and food and cleans up waste, unlike ecology.

## **6. The Gaia hypothesis Applications in Marine Environmental Education**

Marine ecological environment is the basic condition for the survival and development of marine organisms. In order to protect and improve the marine environment, conserve marine resources, prevent and control pollution damage, maintain ecological balance, safeguard human health, and promote the sustainable development of the economy and the society, we have to promote the education on the marine environment, and understand the importance of the education on the marine environment. <sup>[4]</sup>

Marine environmental education is mainly concerned with marine environmental issues arising from human development, and uses awareness, knowledge, attitude, skills and actions in relation to the marine environment as the objectives of the curriculum, with the sustainable development of the marine environment as the ultimate goal. The curriculum is designed to meet the five objectives of "Environmental Awareness and Sensitivity", "Knowledge of Environmental Concepts", "Environmental Values and Attitudes", "Environmental Action Skills" and "Environmental Action Experience" for different age groups. Students are introduced to the importance of the oceans and the role of human beings in utilizing the oceans and conserving the oceans. <sup>[5]</sup>

The Gaia hypothesis, an important implication of marine environmental education, is that marine environmental education should emphasize the coasts and continental shelves. The Gaia hypothesis states that the vital organs of the earth are not found on land but in the "harbors, wetlands, and silt of the continental shelves". Students should be educated about the importance of coastal ecosystems because most of the life in the oceans is concentrated in the shallow waters above the continental shelves, and because the rate of carbon sequestration in these waters automatically regulates the concentration of oxygen in the atmosphere.

There is already too much offshore aquaculture in the coastal areas, and Lovelock believes that the damage caused by offshore aquaculture will be much greater than the impact of any industrial pollution. Therefore, we must pay attention to the "coasts", "marshes" and "wetlands" in the coastal areas, and include them in our general environmental protection actions, and make them our key targets for protection.

## **Conclusion**

Currently, the marine environment is facing many crises, such as the damage caused by offshore aquaculture, which is in fact much greater than the impact of any industrial pollution. Gaia hypothesis, from the perspective of the Earth as a whole, believes that the environment and life co-evolved, and includes two characteristics: life changes the Earth's environment, and the changed Earth's environment promotes the evolution of life. Therefore, we must pay attention to the Gaia hypothesis and emphasize the coasts, marshes, and wetlands in coastal areas, and incorporate them into our education on the marine environment, and make them the focus of our environmental protection actions.

## **References:**

- [1] Lovelock J.E. & Epton S. In Quest for GAIA. in L. P. Pojman (eds), 1994. Environmental Ethics. Jones and Bartlett Publishers, Inc. pp.142-145. 1975.
- [2] Lovelock J. E. GAIA. A New Look at Life on Earth. Taipei: World Culture Publishing Company. 1994.
- [3] DesJardins J. R. Environmental ethics: an introduction to environmental philosophy. Wadsworth, Inc. Belmont, California. 1993
- [4] Yang, Guan-Cheng, Theoretical foundations of environmental values education. Environmental Education Quarterly No.8, pp.3-14, 1995.
- [5] Yang, Guan-Cheng, Environmental Education. Institute of Translation and Interpretation, edited by Ming-Wen Publishing House. 1997.