AMPHIBIAN CULTURE BY INSECT FEEDING

This invention relates to aquaculture; more particularly, this invention relates to the rearing of confined aquatic animals, such as fish, frogs, shrimp, etc. in enclosures. This application is a division of application Ser. No. 477,839, filed June 10, 1974, now abandoned, which is a continuation-in-part of my co-pending U.S. patent application Ser. No. 460,619, filed Apr. 12, 1974, now U.S. Pat. No. 3,939,802, which is a continuation in part of Ser. No. 213,966, filed Dec. 30, 1971, now abandoned. The disclosures of those applications hereby are incorporated herein by reference.

Aquaculture is and long has been plagued by the high cost of feed and the high cost of labor required in feeding aquatic animals which are being raised. For this reason, the price of aquaculture products such as fish, frogs, shrimp, etc. are believed to be higher than they need be.

The culture of aquatic creatures confined in structures such as cages or tanks long has been attractive because it saves or more fully utilizes valuable land. For example, the cage culture of fish permits the use of large natural bodies of water for raising the fish, whereas pond culture methods usually require the expense of building ponds, and often take out of production substantial amounts of farmland which also could be used to advantage in growing row crops such as soy beans, corn, rice, wheat, etc. However, the high cost of feed and labor exists in confined culture as well as pond culture. Furthermore, the advantages of confined culture must be weighed against the cost of the confining structures. For these reasons, it is believed, confined culture has not gained the commercial acceptance that it might have.

In accordance with the foregoing, it is an object of the invention to reduce the cost of the confined culture of aquatic animals. It is a more specific object to reduce the cost of food and labor required in the confined culture of aquatic animals. It is another object of the invention to provide such improvements in the use of floating cages in the culture of aquatic animals. It is also desired to provide better foods for the growth of aquatic animals. Furthermore, it is an object to incrase the effective utilization of cages in cage culture, and thereby lower the cost of providing cages. It is an object to do this while minimizing the extra handling, labor costs and trauma to the animals.

In accordance with the present invention, the foregoing objects are met by the provisions of a method and device for the culture of confined aquatic animals in which other aquatic animals from the water surrounding the confining structure are trapped in the confining structure and used as forage for the animals being reared. The aquatic animals are trapped in the confining structure either alone or with insects, with the insects serving as food for the animals being cultured. Insects alone also can be trapped in the structure. The forage animals preferably are attracted into the enclosure by means of the food fed to the animals being reared. This food can consist of commercial food pellets, or insects captured in insect traps and/or other food items attractive to the forage animals. In the preferred embodiment, the invention is described in use in a system for feeding fish, tadpoles or frogs in cages immersed in natural waterways such as canals, lakes, etc. in which there are substantial quantities of wild forage animals such as minnows, shiners, chubs, mosquito fish, etc. The frogs also are fed insects by trapping the insects in the same enclosure with the frogs. The feeding of aquatic animals on land or water by enclosing them and insects in the same enclosure also is described. The cage culture of aquatic animals is facilitated by providing expandable cages. Thus, the cages can be used to near capacity at all times.

The foregoing and other objects, advantages and features of the invention will be set forth in or apparent from the following description and drawings. In the drawings:

FIG. **1** is a perspective view illustrating the preferred embodiment of the present invention;

FIG. **2** is a cross-sectional view taken along line **2—2** of FIG. **1**;

FIG. **3** is a cross-sectional view of an alternative embodiment of the invention;

FIG. **4** is a perspective view of other alternative embodiments of the invention;

FIGS. **5** and **6** are cross-sectional views of alternative embodiments of the invention;

FIG. **7** is a cross-sectional view taken along line **7—7** of FIG. **6**;

FIG. **8** is an elevation view of another embodiment of the invention;

FIG. **9** is a perspective view of an alternative insect trap-feeder of the invention; and

FIG. **10** is a partial cross-sectional view taken alone line **10—10** of FIG. **9**.

FIG. **1** shows a plurality of fish cages **10** partially immersed in a large body of water **12** such as a lake, canal, river, etc. Each of the cages includes a frame **13** (see FIG. **2**), mesh enclosure material **14**, such as wire mesh coated with protective agents, or plastic screen or mesh. The frame and mesh forms a fish enclosure **16** beneath the surface **15** of the water. Within the enclosure **16** thus formed are retained a substantial number of fish **17** such as channel catfish, trout, etc. to be reared.

The cage **10** includes flotation material such as styrofoam **18** to float the cage on the surface of the water. A cover **20** covers the top of the cage. The cover **20** includes a central hinged portion **21** and side portions **22.** If desired, the cage can be left open.

An insect trap **23** is mounted over an opening in the control portion **21** of the cover **20.** The insect trap is used to lure forage fish and other squatic animals into the cage enclosure **16.**

Outside of the cage enclosure **16** and within the body of water **12** are a plurality of small wild fish **24** which occur naturally in the body of water. These wild fish can be minnows, shiners, mosquito fish, small sunfish or bluegills, perch, etc.

In accordance with one aspect of the invention, several fish-trap entrances **25, 26** and **27** are provided in the walls of the cage **10** below the water-line **15.** Each such entrance includes a frusto-conically shaped wall **28** with an opening **30** at the inner end. The cone faces inwardly toward the interior of the cage.

Still referring to FIG. **2** as well as FIG. **1,** the diameter or smallest dimension D of the opening **30** is made large enough to allow the small fish to enter the cage, but too small to allow the fish being reared to escape from the cage. When the wild fish enter the cage through the openings **30,** because of the inverted conical shape of the entrance, they cannot easily find their way out, and are trapped within the cage enclosure **16.**