

# NATURE MANAGEMENT, RESOURCE SAVING AND ECOLOGY

## Growing carp

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**Abstract.** The results of studies on increasing the volume of carp production under conditions of intensification, the main elements of which are forage and feeding, are presented. Modern conditions attach importance to the quality indicators of raw materials used to obtain food products. That is why the general improvement of ecological conditions of production in combination with the application of ecologically pure forages will ensure reception of marketable production at the level of modern world requirements concerning its quality, which will provide the domestic and world market with products without restrictions. One of the most promising objects of cultivation at this stage of fish farming is carp fish. As confirmed by studies, the cultivation of commercial two-year-old carp in ponds weighing 450–500 g in high stocking densities without intensive feeding is almost impossible, because, with an increase in the fish stocking density per unit of water area, the natural food base is quickly consumed, the lack of which should be replenished by feeding full-fledged feed mixtures or compound feeds, and the amount of feed replenishment will depend on the content of natural food in the ponds and the fish stocking density per unit area. The food activity of fish mainly depends on the temperature of the water and the content of dissolved oxygen in it, and the amount of food consumed depends on the weight of the fish. At water temperatures of 8 – 10 ° C, the digestive activity is gradually activated, physiological and biochemical processes are normalized; at temperatures of 10–14°C, carp get used to the forage, but its digestion is still weakened; at temperatures of 15 – 20 ° C and above, all body systems are restored, it can consume and digest the maximum amount of food, needs regular feeding of fish; water temperatures of 22 – 27 ° C are optimal for nutrition, digestion, and assimilation of nutrients, which has a positive effect on the intensity of the fish's body weight gain. To increase the fish productivity of ponds, it is necessary to rationally apply organic and mineral fertilizers to increase the natural feed for fish and to increase the yield of fish products to grow in polyculture with carp herbivorous fish. It is rational to use artificial feed depending on the season, chemical and biological regime of ponds, and physiological needs of fish.

**Keywords:** two-year-old carp, forage, feeding, weight, trays, ponds, stocking density.

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**Problem setting.** In recent years, as a result of disintegration processes in commercial fish farming, the practice of growing various species and age groups of fish in ponds, pools, gardens, trays, or in closed systems not only in large fish farms but also in small farms has become

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widespread. However, the experience in organizing fish farming, primarily in ensuring adequate feeding of fish, is insufficient or absent for such farms.

**Recent research analysis.** Obtaining high fish productivity in commercial fish farming is impossible without providing full-fledged feeding of fish with artificial feed. Therefore, providing fish farms with high-grade feed and the use of technology for their effective feeding is the main factor in obtaining high fish productivity in each fish farm [3, p.47; 6, p.17].

**Research results.** The research was conducted during the growing season based on ponds "KHMELNYTSKRYBHOSP" Medzhybizh village, Letychiv district, Khmelnytskyi region.

The objects of research were two-year-old carp hybrids, which were kept in polyculture with silver carp and grass carp. Complete parasitological dissection of fish, as well as clinical observations of them, were carried out according to the generally accepted method. At the same time, the influence of the hydrochemical regime of ponds and fish-breeding activities carried out over many years was taken into account.

To determine changes in the parasite fauna of pond fish depending on the habitat, stepwise parasitological dissections, and fish data, planting density, fish feeding, pond fertilizers, hydrochemical and hydrological studies were taken into account.

Historical sources indicate that fish farming as a field of human activity originated before our era, and ancient civilizations were its cradle [1, p.322; 8, p.335].

The intensification of fish production, or in other words, an increase in the fish productivity of ponds, small reservoirs, cooling ponds, planting and basin fish farms, fish farming systems with a return water supply, can have a real basis only if the feed of appropriate quality is used, subject to creative and conscious knowledge of the theory and fish feeding practices [5, p.44; 6, p.15].

There has been a tendency to increase the species composition of cultivated species of fish, mainly due to species for which demand is increased due to high gastronomic and dietary properties recently [7, p.165].

There is a long and steady trend in world fish farming - the importance of feed and fish feeding is steadily increasing with rising levels of intensification. It will undoubtedly remain relevant today [2, p.163].

Mastering the principles of rational use of feed and

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modern methods of feeding fish opens up opportunities for a specialist to significantly reduce feed consumption per unit of fish products [4, p. 38].

The study aimed to increase the volume of carp production only under conditions of intensification, the main elements of which are forages and feeding. Modern conditions attach importance to the quality of raw materials used to produce food. That is why the general improvement of ecological conditions of production in combination with the application of ecologically pure forages will provide reception of marketable production at the level of modern world requirements concerning its quality, which will give to the domestic and world market production without restrictions. One of the most promising objects of cultivation at this stage of fish farming is carp fish.

As confirmed by studies, the cultivation of commercial two-year-old carp in ponds weighing 450–500 g in high stocking densities without intensive feeding is almost impossible, because, with an increase in the fish stocking density per unit of water area, the natural food base is quickly consumed, the lack of which should be replenished by feeding full-fledged feed mixtures or compound feeds, and the amount of feed replenishment will depend on the content of natural food in the ponds and the fish stocking density per unit area. The food activity of fish mainly depends on the temperature of the water and the content of dissolved oxygen in it, and the amount of food consumed depends on the weight of the fish. At water temperatures of 8 – 10 ° C, the digestive activity is gradually activated, physiological and biochemical processes are normalized; at temperatures of 10–14 ° C, carp get used to the forage, but its digestion is still weakened; at temperatures of 15 – 20 ° C and above, all body systems are restored, it can consume and digest the maximum amount of food, needs regular feeding of fish; water temperatures of 22 – 27 ° C are optimal for nutrition, digestion, and assimilation of nutrients, which has a positive effect on the intensity of the fish's body weight gain.

Feeding of the fish began in May at a temperature of 14°C, so that the fish get used to taking food at feeding places or paths. Compound feed was given in small doses (2 – 3% of the weight of the planted fish) in shallow areas of the pond, which are well warmed up by the sun. Over the next 10 days, the fish got used to the food. As the temperature increased to 18–20 ° C at the end of May, the daily rations were

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increased to 6-8% of the fish weight. Feed consumption in May was 11 - 14, in June - 30 - 65, in July - August - 100 kg/ha.

Feed costs during the growing season are presented in Table 1.

Table 1

**Feed costs for feeding biennial carp, % of the total**

Month	Feed costs by decades			Totally per month
May		1,0	7,0	8
June	6,0	8,0	8,0	22
July	8	10,0	13,0	31
August	14,0	12	8,0	34
September	4,0	1,0		5

The growing season for raising marketable carp was conventionally divided into two periods. The first - feeding began a few weeks after the stocking of the feeding ponds, lasted until mid-July, and was accompanied by active consumption by fish during the first 40-50 days of the natural food base before it was devoured. During this period, the given feed contained a significant amount of protein. During the first week, the feed was provided only 2 - 3 times, after which the fish were transferred to daily feeding with a one-time feed distribution. Such a feeding regime in the first period is explained by the fact that in early spring, after wintering, the level of reserve nutrients in the body of one-year-old carp is quite low, their body is weakened, which reduces the efficiency of searching for natural food, which, moreover, is underdeveloped at the beginning of this period with a shortage of natural food during this period, feeding fish with high-protein compound feeds is of decisive importance, ensures the renewal and intensive accumulation of reserve nutrients, stimulates the intake of vitamins into the body, which has a positive effect on the growth rates of fish.

During the second growing period, which lasted 70 days, feeds with a slightly lower protein content of 16% were provided. It is characterized by deterioration of physicochemical parameters of the environment in feeding ponds, water temperature fluctuated in the range of 20 - 25°C, the level of development of the natural fodder base can vary within wide limits. During this period there were quite significant changes in the physiological and biochemical

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processes of the carp body when carbohydrate metabolism prevails over another, which is accompanied by the accumulation of glycogen and fat. All this confirms the feasibility of introducing low-protein feed into feeding.

The daily feeding rate was regulated depending on the content of oxygen dissolved in water, measured in the morning hours near the feeding points. With a content of 5–6 mg / l oxygen in water, 100% of the daily ration was given. Food was distributed at special feeding places (Table 2).

Table 2

Oxygen content in water, mg / l	Daily rate,% of the initial
more than 5,5	100
4,0 – 5,5	70 – 90
3,0 – 4,0	40 – 60
2,5 – 3,0	20 – 30
less than 2,5	didn't feed

**Reduction of the initial daily feeding norms depending  
on the oxygen regime**

Nutritional quality of feed and physicochemical parameters of the environment determined the indicators of daily weight gain of carp (Table 3).

Table 3

**The average daily weight gain of carp depending on the protein content  
in the feed and water temperature**

Water temperature, °C	The average daily weight gain of carp, g for protein content, %		
	Under 25	30	35
10	1,0 – 1,5	1,5 – 2,0	2,0 – 2,5
15	2,0 – 3,5	3,0 – 4,0	4,0 – 5,0
20	4,0 – 5,0	4,5 – 5,5	5,5 – 6,5
25	5,5 – 6,5	6,0 – 7,5	7,0 – 8,0

After providing the feed, in 100 – 120 minutes. Feed consumption by fish was checked, which was determined by the remains of food at feeding places using a mesh scoop. If residues were found, the feeding rate was reduced.

To obtain standard commercial biennials of carp, one needs to ensure a monthly regulatory increase in its weight (Table 4).

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Table 4

**Weight gain of biennial carp in experimental ponds**

Indicators	Growth
Initial weight of one-year-olds, g	25-30
Weight gain, g	
on 10, May	6
from 11 to 20 May	17
from 21 to 31 May	28
from 1 to 10 June	34
from 11 to 20 June	46
from 21 to 30 June	54
from 1 to 10 July	62
from 11 to 20 July	68
from 21 to 31 July	67
from 1 to 10 August	48
from 11 to 20 August	32
from 21 August before the catch	14
Commodity weight of caught biennials, g	500

For feeding two-year-old carp, fish compound feed of recipe 110 - 1 was used, consisting of feed ingredients of plant and animal origin. This recipe has been designed with the nutrient needs of fish in mind. The composition of compound feed for feeding fish according to the recipe 110 - 1, shown in table 5.

Table 5

**The composition of feed**

Ingredients	Content, %	Exchange energy, MJ/ kg	Fodder units in 1 kg	Crude protein %	Crude fat %	BER %
Wheat	40	5,4	0,5	5,3	0,9	26,4
Barley	25	5,6	0,5	5,0	0,9	28,2
Sunflower cake	15	1,8	0,2	6,1	1,1	3,4
Peas	8	0,7	0,06	1,1	0,1	2,7
Fodder yeast	10	-	-	-	-	-
Chalk	2	-	-	-	-	-
Totally	100	13,5	1,26	17,5	3,0	60,7

Compound feed recipes are developed taking into account the feeding of different age groups of carp. Based on the developed recipes, the feed industry, based on the availability of feed resources, produces feed, the

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composition of which corresponds to the approved recipe, and their ratio determines the total and biological value of feed.

To increase the fish productivity of ponds, it is necessary to rationally apply organic and mineral fertilizers to increase the natural feed for fish and to increase the yield of fish products to grow in polyculture with carp herbivorous fish. It is rational to use artificial feed depending on the season, chemical and biological regime of ponds, and physiological needs of fish.

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