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Economic development of fishery and accounting support of cost management for biological conversion in fish farming of Ukraine comparing to the other CEE countries

Abstract. Over the last decade, the fishing industry in Ukraine has a negative trend, while in the other CEE countries (Belarus, Poland, and The Czech Republic) there is an increase in production. The study highlights the strengths and weaknesses of the industry in Ukraine and its international trade capacity in comparison with some other CEE countries. It is stated that the economic efficiency of growing domestic fishery products is determined by the level of its costs and market price impacted by producers to a much higher extent than in any other type of agricultural product.

We determine that the main problem with regard to accounting and analytical support of biological transformations in fisheries is the lack of theoretical substantiation and the imperfection of the methodology of accounting management of the costs of biological transformations in the field. It is emphasized that the basic condition for effective management of costs for the production of fishery products and providing accounting information about them is the existence of sound accounting methodology for managing the costs of biological transformation.

Controlled (relevant) segments in the fisheries sector are identified to solve the problem with their simultaneous division into separate production processes (repartitions). The application of the proposed classification of production redistribution will improve the system of synthetic and analytical accounting of biological assets and biological transformations and will provide information needed for managers.

The influence of organizational and technological peculiarities of the aquaculture production process on the developing of the accounting system of fishery enterprises has been investigated which gives the opportunity to develop and implement an adequate accounting system of cost management at the enterprises of the branch. It is stated that the main prerequisite for effective cost management is the objective display of cost information in space and time.

We propose to appoint the cost of production of fishery products at the end of each production redistribution. At the end of the calendar year, the costs of each redistribution the cycle of which has not been completed should be considered as an unfinished production of the fisheries industry. The expediency of accepting the total volume of production in natural meters as the basis for the distribution of indirect fisheries costs is substantiated. The examples of calculations and accounting approaches are given to support the authors' statements and conclusions.

Keywords: Biological Assets; Agricultural Products; Production Costs; Fish Farming; Fishery Enterprise; Aquaculture; Biodiversity; Polyculture Growing; Expenditure Accounting; Accounting Of Production Process; Method Of Accounting For Biological Assets; Information Management

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**Економічний розвиток рибогосподарського комплексу
й облікове забезпечення управління витратами на біологічні перетворення
в рибницьких господарствах України порівняно з іншими країнами ЦСЄ**

Анотація. За останнє десятиріччя рибницька галузь в Україні має негативну тенденцію, тоді як в інших країнах ЦСЄ (Білорусі, Польщі, Чехії) спостерігається нарощення обсягів виробництва. У дослідженні виділено сильні та слабкі сторони розвитку галузі в Україні та її експортно-імпорتنний потенціал порівняно з іншими країнами ЦСЄ. Вказано, що економічна ефективність вирощування продукції вітчизняного рибництва визначається рівнем її собівартості та ринковою ціною, вплив на яку товаровиробник має значно вищий порівняно з іншими видами аграрної продукції. Це обумовлено тим, що на ринок продукція надходить безпосередньо від виробника до споживача, без участі численних посередників. Означений вид агробізнесу є конкурентоспроможним й економічно привабливим з точки зору залучення інвестицій.

У статті визначено, що основною проблемою щодо обліково-аналітичного забезпечення біологічних перетворень у рибництві є недостатність теоретичного обґрунтування й недосконалість методики облікового забезпечення управління витратами на біологічні перетворення в даній галузі. Наголошено, що основною умовою ефективного управління витратами на виробництво продукції рибництва та забезпечення обліковою інформацією про них є наявність обґрунтованої методики облікового забезпечення управління витратами на біологічні перетворення.

Для вирішення проблеми визначено контрольовані (релевантні) сегменти у рибницькій галузі з одночасним їх поділом на окремі виробничі процеси (переділи). Застосування запропонованої класифікації переділів виробництва поліпшить систему ведення синтетичного й аналітичного обліку біологічних активів і біологічних перетворень, а також забезпечить інформаційні потреби менеджерів.

Авторами досліджено вплив організаційно-технологічних особливостей процесу виробництва продукції аквакультури на побудову системи бухгалтерського обліку рибогосподарських підприємств, що дає можливість розробити та впровадити адекватну систему облікового забезпечення управління витратами на підприємствах галузі. Зазначено, що основною передумовою ефективного управління витратами є об'єктивне відображення інформації про витрати в просторі та часі. Запропоновано розподіл загальновиробничих витрат і калькулювання собівартості продукції рибництва здійснювати після завершення кожного виробничого переділу. Із завершенням календарного року витрати кожного переділу, цикл якого не завершений, слід вважати незавершеним виробництвом галузі рибництва. Обґрунтовано доцільність прийняття за базу розподілу непрямих витрат рибництва загальний обсяг виготовленої продукції в натуральних одиницях виміру. На підтвердження заявлених підходів і висновків авторів наводяться приклади розрахунків й алгоритми ведення обліку.

Ключові слова: біологічні активи; сільськогосподарська продукція; виробничі витрати; рибництво; рибне підприємство; аквакультура; біорізноманіття; вирощування полікультури; облік витрат; облік виробничого процесу; метод обліку біологічних активів; управління інформацією.

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Экономическое развитие рыбохозяйственного комплекса и учетное обеспечение управления расходами на биологические преобразования в рыболовных хозяйствах Украины по сравнению с другими странами ЦВЕ

Аннотация. За последнее десятилетие рыбная отрасль в Украине имеет негативную тенденцию, тогда как в других странах ЦВЕ (Беларуси, Польше, Чехии) наблюдается наращивание объемов производства. В исследовании выделены сильные и слабые стороны развития отрасли в Украине и ее экспортно-импортный потенциал по сравнению с другими странами ЦВЕ. Указано, что экономическая эффективность выращивания продукции отечественного рыболовства определяется уровнем ее себестоимости и рыночной ценой, влияние на которую товаропроизводитель имеет значительно выше по сравнению с другими видами аграрной продукции. Это обусловлено тем, что на рынок продукция поступает непосредственно от производителя к потребителю, без участия многочисленных посредников. Указанный вид агробизнеса является конкурентоспособным и экономически привлекательным с точки зрения инвестиций.

Определено, что основной проблемой учетно-аналитического обеспечения биологических преобразований в рыболовстве является недостаточность теоретического обоснования и несовершенство методики учетного обеспечения управления затратами на биологические преобразования в данной области. Отмечено, что основным условием эффективного управления затратами на производство продукции рыболовства и обеспечение учетной информацией о них является наличие обоснованной методики учетного обеспечения управления затратами на биологические преобразования.

Для решения проблемы определены контролируемые (релевантные) сегменты в рыболовческой отрасли с одновременным их разделением на отдельные производственные процессы (переделы). Применение предложенной классификации переделов производства улучшит систему ведения синтетического и аналитического учета биологических активов и биологических преобразований, а также обеспечит информационные потребности менеджеров.

Авторами исследовано влияние организационно-технологических особенностей процесса производства продукции аквакультуры на построение системы бухгалтерского учета рыбохозяйственных предприятий, что дает возможность разработать и внедрить адекватную систему учетного обеспечения управления затратами на предприятиях отрасли. Указано, что основной предпосылкой эффективного управления затратами является объективное отражение информации о расходах в пространстве и времени. Предложено распределение общепроизводственных затрат и калькулирование себестоимости продукции рыболовства осуществлять после завершения каждого производственного передела. По завершении календарного года расходы каждого передела, цикл которого не завершен, следует считать незавершенным производством отрасли рыболовства. Обоснована целесообразность принятия за основу распределения косвенных расходов рыболовства общего объема произведенной продукции в натуральных измерителях. В подтверждение заявленных подходов и выводов авторов приводятся примеры расчетов и алгоритмы ведения учета.

Ключевые слова: биологические активы; сельскохозяйственная продукция; производственные затраты; рыболовство; рыбное предприятие; аквакультура; биоразнообразие; выращивание поликультуры; учет затрат; учет производственного процесса; метод учета биологических активов; управление информацией.

1. Introduction

In the modern economic conditions, there is a problem of finding new methods of cost management in fisheries in order to reduce the cost of production and ensure its competitiveness. However, the situation is compounded by the fact that fisheries were in the nascent stages of economic reform and have not yet acquired adequate logistical and financial support, and the issue of accounting and analytical support for cost management was not given a separate role. Today the situation has changed dramatically. Management decisions are made based on data of accounting and analytical information system.

In our study, we pay a particular attention to the economic and accounting category of general production costs (overhead costs) as they are called in the Ukrainian national instructions to the accounting based on IAS 2 - «Inventories». Overhead costs have different referring and explanations in economic literature. In regard to our subject, which is fishery and production, they are also called indirect manufacturing costs and factory overhead. They include direct factory-related costs that are incurred when producing a product. Overhead is also used to characterize three general kinds of costs, namely: those for indirect materials, indirect labour, and all other miscellaneous production expenses (for example, taxes, insurance, depreciation, supplies, utilities, and repairs) upon the specific national regulation and practice in place.

The information base of the research includes the latest data of CEE national statistics services as of the beginning of 2020. Therefore, the period under analysis and investigation is

2011-2018. As far as the process of increasing the volume of fishery products production is time- and resource-consuming, the tendencies and situation shown in our research stay relevant for the years ahead.

2. Brief Literature Review

The systematic research of accounting support of cost management of the enterprise through the prism of management needs have recently been opened up in the works of leading domestic scientists conducting research in the field of cost accounting methodology, as well as the foreign ones: M. Milling (2019), F.-A. Guinea (2016), C. Cretu and V. Gheonea (2011), J. D'Souza et al. (2000), H. Saygili (2009).

In Ukrainian practice there is experience in determining the methodology for accounting for the costs of production of biological assets. In particular, O. Smolskaya (2015) examined the state of accounting for production costs in crop production, T. Vovchuk (2009) - in forestry. Many methodological recommendations for accounting in fisheries are provided by N. Vdovenko et al. (2007, 2017). The main components of agricultural accounting policies have been investigated by I. Tomashuk (2019), N. Zdyrko (2012), N. Pravdiuk (2005) and others. However, the issue of accounting for the management of expenditures on biological assets of fisheries has not been adequately addressed and needs more analysis.

3. The purpose of the paper consists in the theoretical and methodological substantiation and development of practical recommendations for the improvement of accounting management of the costs of biological transformations in fisheries, in particular the accounting and distribution of general production costs (overhead costs).

4. Results

The fisheries sector of Ukraine plays a significant role in providing the population with food and the sectors of national economy - with raw materials. This branch of agribusiness contributes to the reproduction of natural resources and increases the employment of the population.

The dynamics of aquatic bioresources production in Ukraine over the last decade has been negative. The fish catch in 2018 decreased by 17 thousand tonnes (or 21%) compared to 2017 and according to State Fiscal Service of Ukraine data amounted to 64.7 thousand tonnes (Table 1).

The occupation of Crimea has become one of the most negative consequences for the development of domestic fisheries. As a result, fishing ports and fisheries enterprises were lost to fisheries research institutions (Pravdiuk, 2017). State Fiscal Service of Ukraine since 2014 provides data on the volume of extraction of other aquatic living resources, without taking into account the temporarily occupied territory of the Autonomous Republic of Crimea and Sevastopol. Therefore, we consider it advisable to carry out the survey for 2009-2018 without taking into account the indicators of the mentioned territories (Figure 1).

According to the results of the study, it is concluded that the volume of extraction of living aquatic bioresources, and therefore of fish directly, in Ukraine during this period tends to decrease.

Considering the statistics of the fishing industry in foreign countries (Belarus, The Czech Republic, Poland), it is concluded that the decline of the industry is observed in Ukraine (Figure 2).

Table 1:
Extraction of aquatic bioresources*

No.	Year	Units of measurement	Aquatic bioresources	Growth rate	Including fish	Growth rate
			tonnes	in % to the previous period	tonnes	in % to the previous period
3	2011		80848		80273	
4	2012		77057	-4.69	76048	-5.26
5	2013		83485	8.34	82353	8.29
6	2014		91252	9.30	80958	-1.69
7	2015		88552	-2.96	73963	-8.64
8	2016		88443	-0.12	78490	6.12
9	2017		92645	4.75	81875	4.31
10	2018		86222.5	-6.93	64737.9	-20.93

Note: * - excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Sevastopol.

Source: State Fiscal Service of Ukraine, 2020b

The analysis of the available actual statistics of the main economic indicators of the activities of fishery enterprises showed that despite the loss of fish production, this type of agribusiness is quite competitive and economically attractive from the point of view of investments.

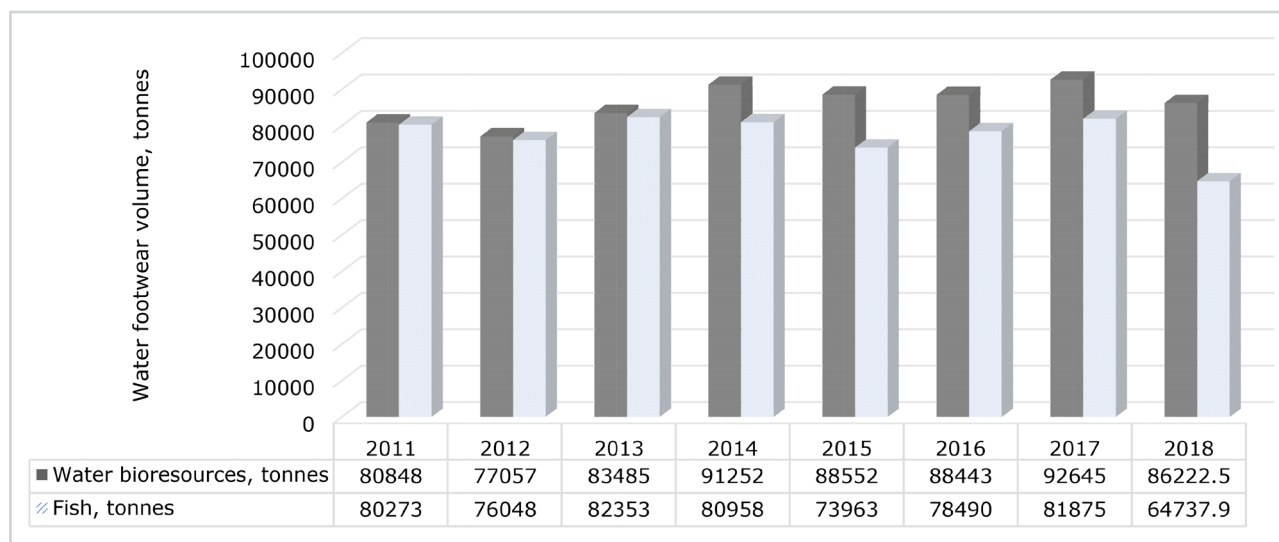


Figure 1:

Catching of fish and extraction of other aquatic living resources in 2011-2018*, tonnes

Note: * - excluding the temporarily occupied territory of the Autonomous Republic of Crimea and Sevastopol.

Source: State Fiscal Service of Ukraine, 2020b

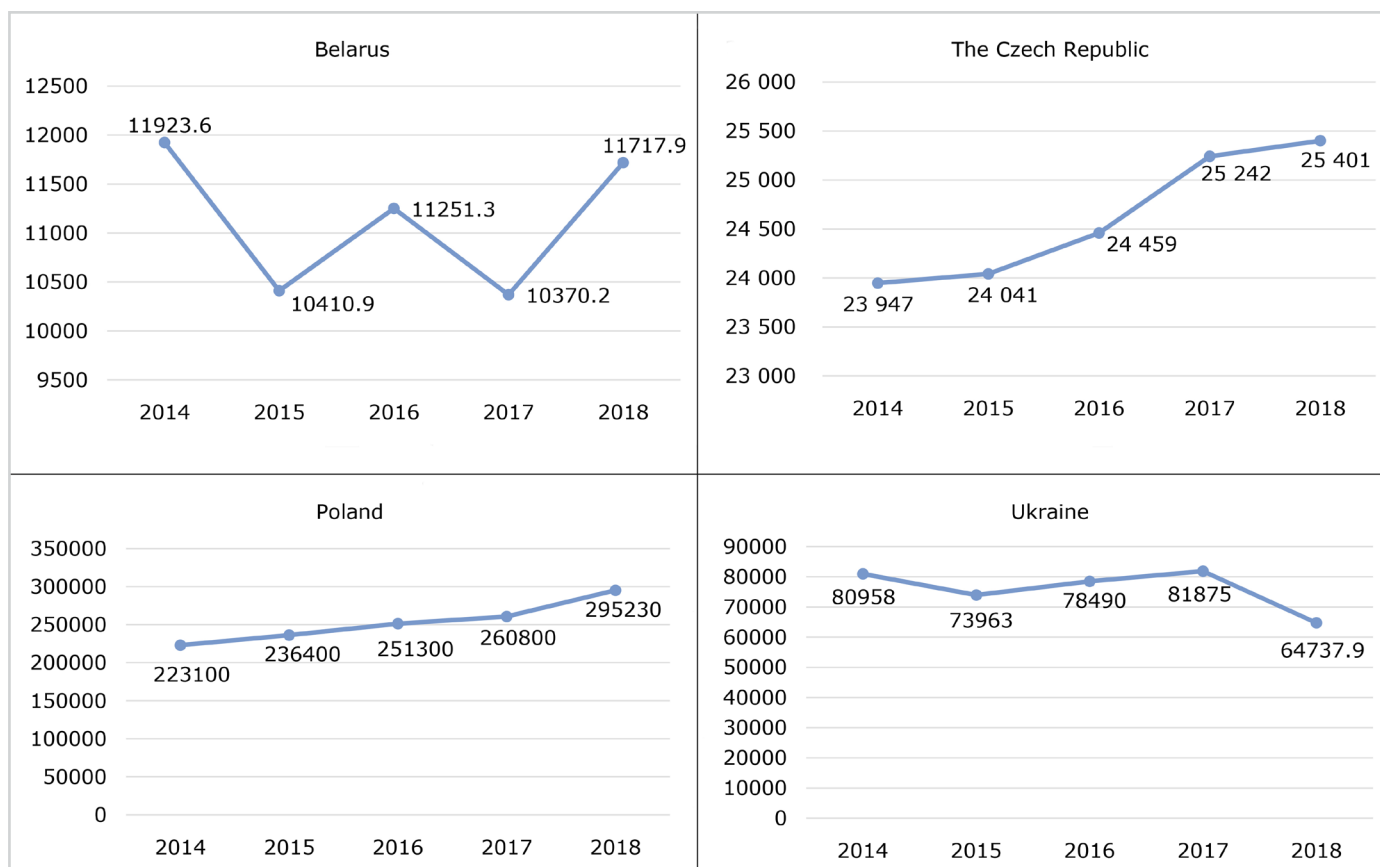


Figure 2:

Comparison of the fishing industry in The Czech Republic, Poland, Belarus and Ukraine in 2014-2018, tonnes

Source: Compiled by the authors using data of the Central Statistical Office of Poland (2020); the National Statistical Committee of The Republic of Belarus (2020); The Czech Statistical Office (2020); State Fiscal Service of Ukraine (2020b)

Fisheries allow for high income in a small area and require a minimum of technical means compared to other agrarian sectors of the economy and stable solvent demand for products.

According to the calculated statistics, in 2018 in Ukraine the consumption of fish and fishery products is 11.8 kg per person a year, which is 9.2% more than the consumption of the similar product in 2017. For reference: the rational rate of consumption of fish and fishery products by Ukrainians, according to the recommendations of the Ministry of Health, was set at the level of 20 kg per person a year, which was not achieved during the years of Ukraine's independence. The results of the analysis of the consumption of staple food by one person are grouped in Figure 3.

A large proportion of the supply of fishery products in the domestic market is provided by imports, which according to balance sheet calculations account for 75% of domestic consumption. According to operational customs data, in 2018, imports of fish and fishery products increased by 10% to 344 thousand tonnes. Three quarters of imports of fishery products are frozen fish, the main suppliers of which are Iceland, Norway and the USA.

We will analyze the volume of foreign trade turnover of fishery and fishery products of Ukraine for 2011-2018 by the sum of codes 301-308 of the Ukrainian Classifier of Goods of Foreign Economic Activity.

These are products such as: 301 «Live fish», 302 «Fresh or chilled fish», 303 «Frozen fish», 304 «Fish fillets and other fish meat», 305 «Dried, salted, smoked fish», 306 «Crustacea», 307 «Shellfish», 308 «Water invertebrates» (Table 2).

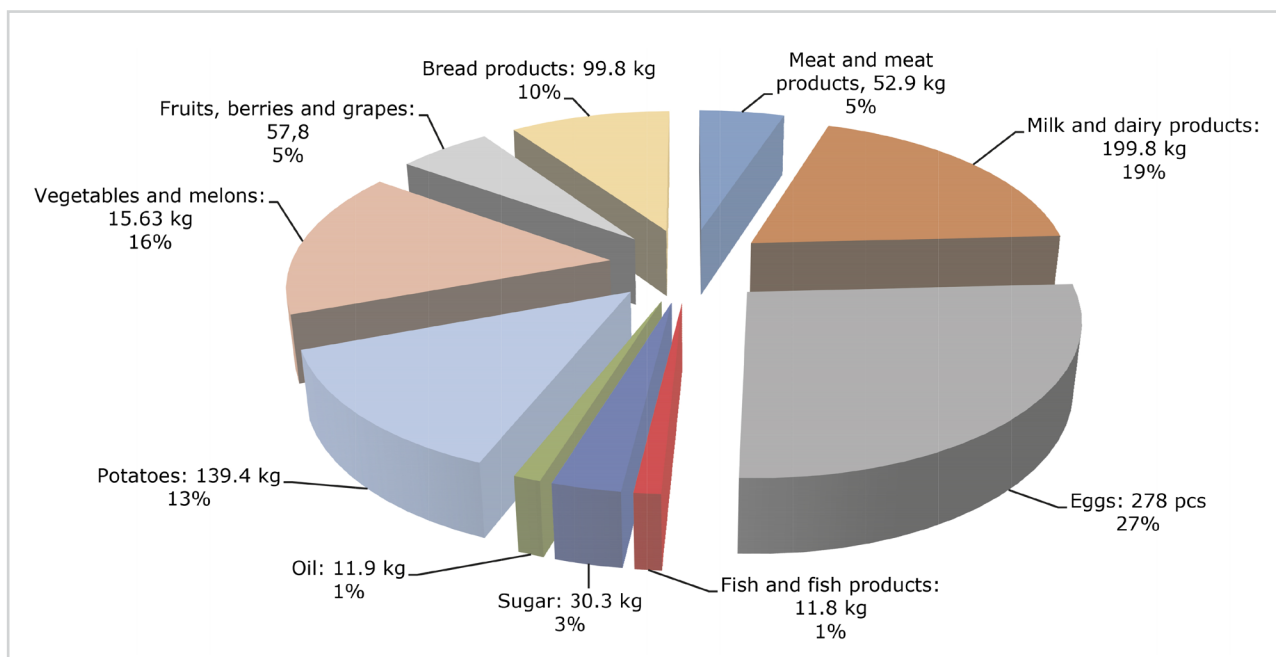


Figure 3:

Consumption of staple food by one person for 2018 in absolute and relative terms

Source: State Fiscal Service of Ukraine, 2020a

Table 2:

Total imports and exports of fish and fishery products 2011-2018, USD thousand

Year	Import Value, USD thousand	Imports, net weight, tonnes	Growth rate, %	Exports Value, USD thousand	Exports net weight, tonnes	Growth rate, %	Balance, USD thousand
2011	505472	346810		4327	883		-501145
2012	687663	382775	10.37	5802	2917	34.09	-681861
2013	863372	415310	8.50	9291	2884	60.13	-854081
2014	595504	308677	-25.68	10228	1699	10.09	-585276
2015	292237	210415	-31.83	10952	2973	7.08	-281285
2016	409982	272709	29.61	17007	5172	55.29	-392975
2017	455527	296391	8.68	26376	5311	55.09	-429151
2018	549529	344424	16.21	24982	4887	-5.29	-524547
	4359286	2577511		108965	26726		-4250321

Source: State Statistics Service of Ukraine, 2020

Therefore, the volume of imports and exports of aquaculture products is increasing every year. In addition, the growth rate of exports of these products exceeds the growth rate of imports. However, one should not be comforted by the ghostly gains on increasing exports from Ukraine. Ukraine specializes in supplying low-processed products.

Exports are focused on raw fishery products and without a radical restructuring of the industry Ukraine will not be able to take full advantage of export expansion opportunities. It is worth noting that the supply of fishery products in the domestic market is mainly provided through imports.

The structure of import and export deliveries of products according to the above codes is shown in Figure 4.

According to the calculations made on the basis of State Statistics Service of Ukraine and State Fiscal Service of Ukraine data, the share of imported fish and fishery products is about 70% of total consumption in Ukraine (Figure 5).

It is not worth expecting a decrease in imports in 2019-2020. As the process of increasing the volume of production of Ukrainian fishery products is long and requires considerable investment.

According to the results of the analysis of fish and aquatic bioresources by species, it was determined that the following aquatic bioresources were recovered in Ukraine in 2018: marine goby (18.2%) carp (14.2%), silver carp (15.4%), crucian carp freshwater (12.5%). The catch of other fish is not significant. The results of the study are reflected in Figure 6.

The economic efficiency of growing domestic fishery products is determined not only by the level of its cost, but also by the market price, on which the producer influences more in comparison with other kinds of agricultural products. This is due to the fact that in the market the products come directly from the producer to the consumer, directly, without the participation of numerous intermediaries.

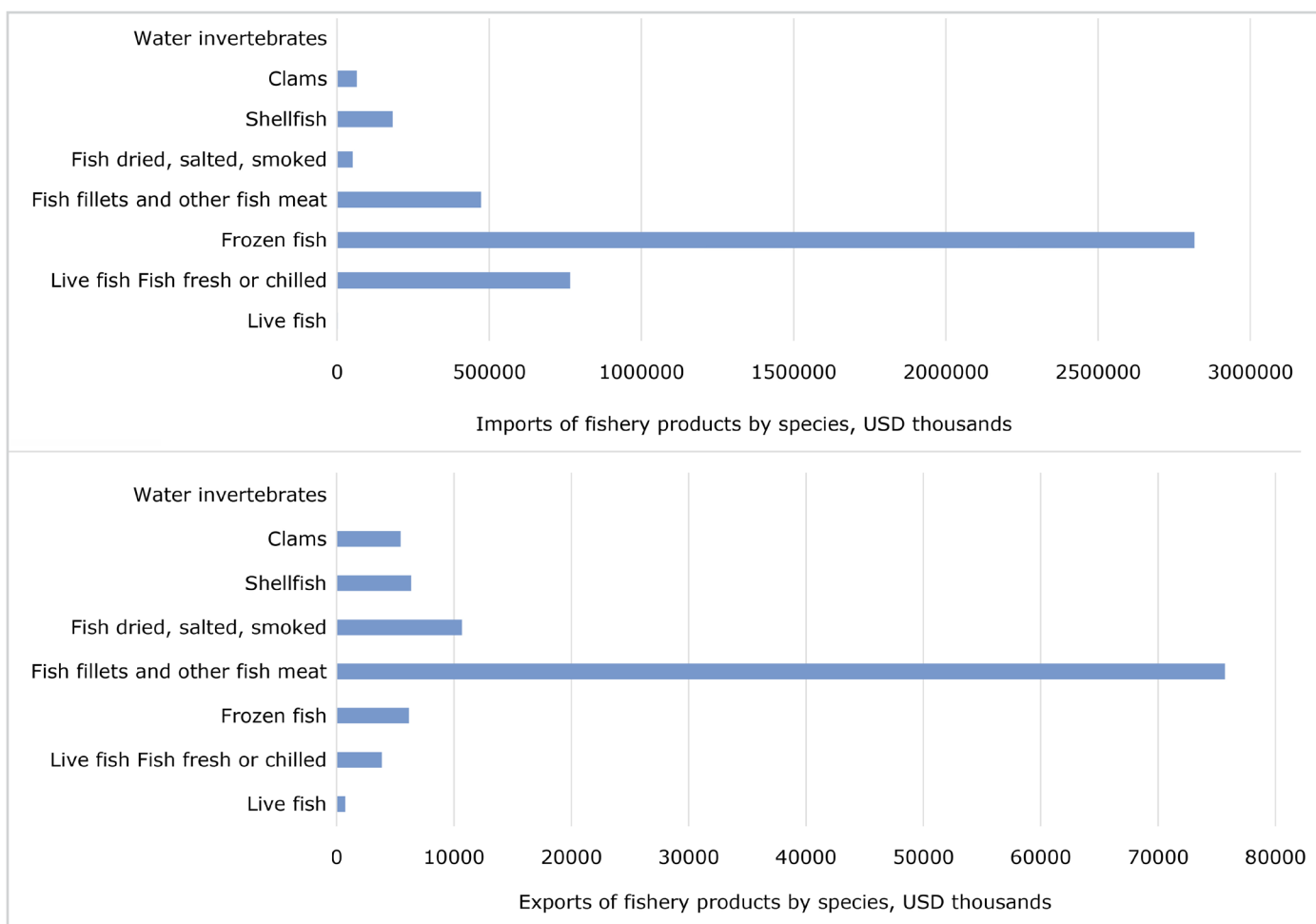


Figure 4:
Structure of import and export deliveries for 2011-2018
Source: State Statistics Service of Ukraine, 2020

The main factors hampering the development of fisheries in Ukraine are:

- not rational use of reservoirs: most of them are neglected;
- disproportionately high rents for water resources set by local government officials;
- high price of feed, which in turn raises the price of fish products. For example, in order for the carp to gain 1 kg of weight, it is needed 3 kg of feed. In case of refusing to feed the fish with expensive feed, the fish productivity is significantly reduced;
- a narrow range of farmed fish (fish farms mainly grow carp, silver carp and white carp, and all other fish species in small numbers).

Equally important factor in slowing down fishery development is the emigration of highly skilled fish farmers outside Ukraine in search of a decent income. Non-regulation of legal norms adversely affects the activities of both state and private fisheries enterprises.

Strong revolutionary decisions are needed to raise fisheries. Use of state-level reservoirs for their rational use should be streamlined. In addition, as Ya. Ishchenko points out, «modern market economic relations determine the need for changes in the fishery strategy, according to which priority should be given to increasing gross production and expanding the range of products with the use of modern intensive industrial technologies» (Ya. Ishchenko, 2016a).

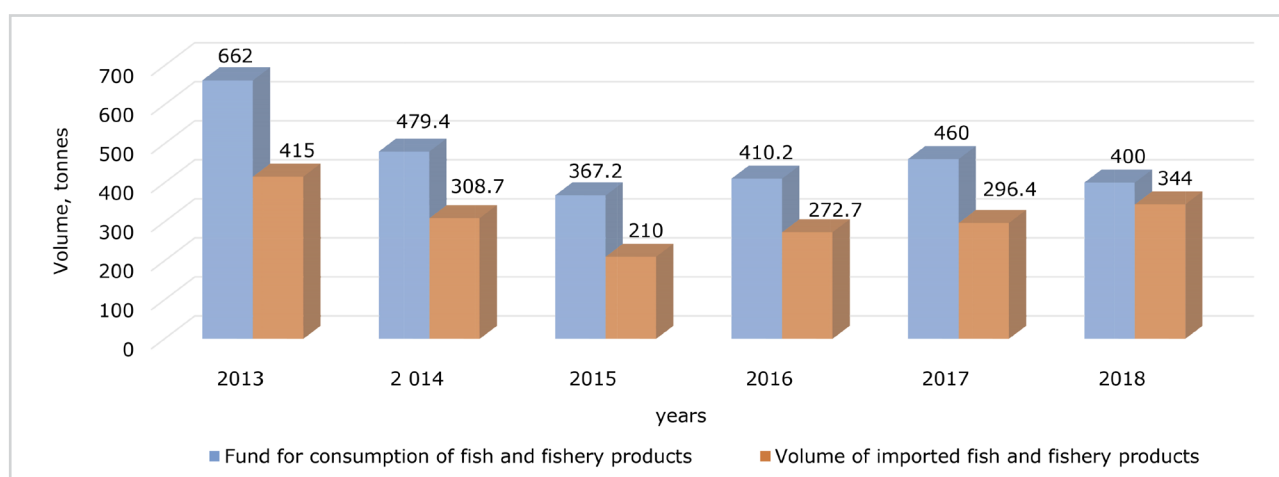


Figure 5:

The share of imports in the total consumption of fish and fish products by Ukrainians

Source: Compiled by the authors using data of State Statistics Service of Ukraine (2020), State Fiscal Service of Ukraine (2020a)

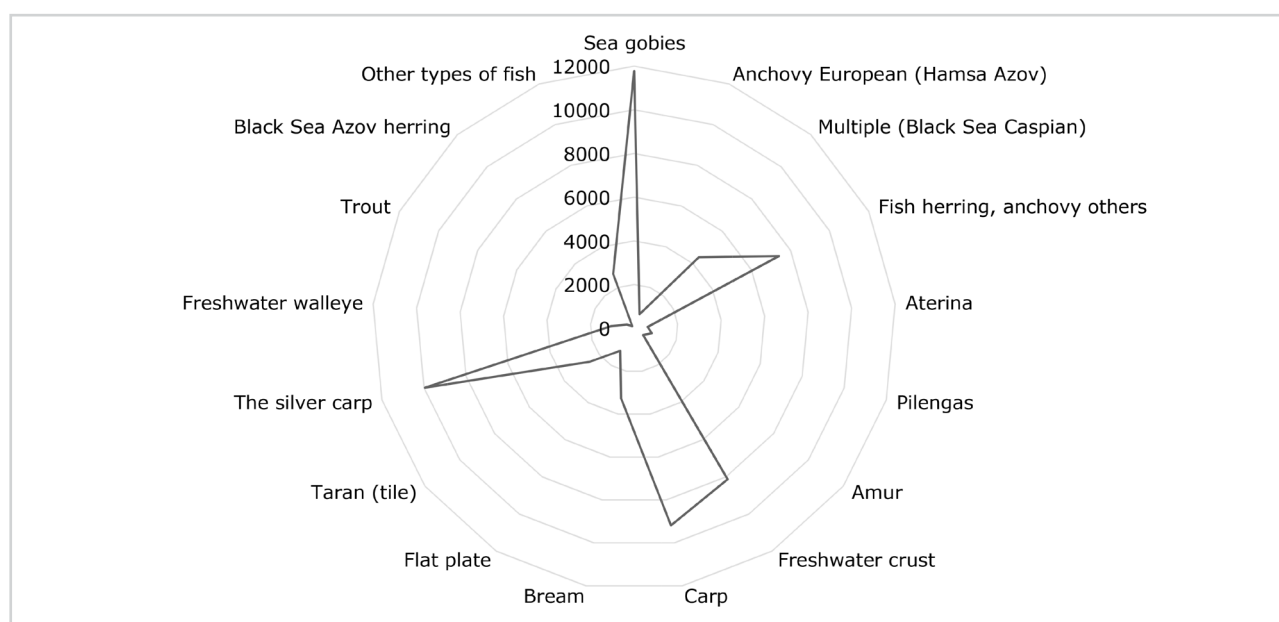


Figure 6:

Fish catch in Ukraine by species in 2018, tonnes

Source: Compiled by the authors using data of State Fiscal Service of Ukraine (2020b)

In order to properly implement the latter proposal, again, the government intervention is required to financially support these measures. To solve the problem at the micro level, you need to create a cost management system that includes information and accounting segments. M. Pravdiuk (2017) concluded that the implementation of the accounting function in the management system is possible through the improvement of the management production mechanism of aquaculture products - the development of theoretical, organizational and methodological provisions of accounting support for production and display of accounting information in the enterprises' reporting.

The goal of biological transformation management is to optimize the use of enterprises' resources in the process of their activity.

Therefore, to manage the costs of biological conversion in fisheries, the following issues need to be addressed:

- 1) to identify segments of production that are constantly influenced by the managers of the enterprise;
- 2) to formulate an overall strategic goal of reducing costs in the production of fisheries products;
- 3) to provide an objective distribution of costs in space and time.

To solve the first problem, we have identified controlled (relevant) segments in the fisheries sector, with the simultaneous division of them into separate production processes (redistribution). Such segments are the stages of biological transformation in fisheries. Taking into account the specificity of the fishery products production, we propose to apply a preliminary method of cost accounting and calculation, the main purpose of which is to calculate the cost of a particular product at the completion of each stage of biological transformation (Table 3).

In the management of costs, there are two areas: the first one is management of production of a specific product, and the second one is management of homogeneous technological operations. Each redistribution is a separate essential production process in the production of fishery products.

Production structure for the product involves the creation of independent production units, focused on the production and marketing of specific products. In fisheries, the example of such production units may be the unit for the cultivation of fish material, the unit for the production of commercial fish etc. The production structure, organized by homogeneous technological operations, involves the creation of production units focused on the execution of special technological

Table 3:
Stages of biological transformation and determination of the objects of calculation in the fisheries' cost accounting method

The redistribution number	Stage of biological transformation	Type of product (biological asset)	Unit of calculation	Calculation period
1	2	3	5	6
1 redistribution of production	0 stage of biological transformation	primordial, larva, fries	1 thousands of pieces, 1 kg, 1 h.	the period of catching or changing the location of the biological asset or finished product
2 redistribution of production	I stage of biological transformation	this year or 1 summer old (fish age: 0+)	1 thousands of pieces, 1 kg, 1 h.	
3 redistribution of production	II stage of biological transformation	1 year old (fish age: 1)	1 thousands of pieces, 1 kg, 1 h.	
4 redistribution of production	III stage of biological transformation	2 summer old (fish age: 1+)	1 thousands of pieces, 1 kg, 1 h.	
5 redistribution of production	IV stage of biological transformation	2 years old (fish age: 2)	1 thousands of pieces, 1 kg, 1 h.	
6 redistribution of production	V stage of biological transformation	3 summer old (fish age: 2+) commodity fish over a two-year production cycle	1 thousands of pieces, 1 kg, 1 h.	
7 redistribution of production	VI stage of biological transformation	3 years old (fish age: 3), commodity fish over a two-year production cycle	1 pieces, 1 thousands of pieces, 1 kg, 1 h.	
8 redistribution of production	VII stage of biological transformation	4 summer old (fish age: 3+), commodity fish over a three-year production cycle, repair young	1 pieces, 1 kg, 1 h.	
9 redistribution of production	VIII stage of biological transformation	uterine stock (fetuses) maintenance costs increase the cost of the offspring	1 pieces, 1 kg, 1 h.	

Source: Compiled by the authors

operations on the same type of equipment, for example, units formed by types of production and specialized rates. Thus, most agricultural enterprises in the fisheries sector are enterprises with complex organizational and production structures. This leads to the construction of a complex structure of biological conversion cost management facilities. After all, the basic condition for effective management of costs for the production of fisheries products and provision of accounting information about them is the relationship between the objects of cost management and the objects of cost accounting. We agree with Ya. Ishchenko's statement that «to obtain information about a management entity, it is necessary to create a system of accounting that has elements identical to management entities» (Ya. Ishchenko, 2016b).

In order to accomplish the second task, it must be born in mind that cost management should not entail an absolute reduction in costs but should prevent the occurrence of potentially inefficient costs. That is, the costs incurred must be justified by the economic benefits received.

The costs of biological conversion in fisheries should be managed throughout the enterprise hierarchy. In fisheries, the cost management segments will depend on the organizational production and technological features of the enterprise which are highlighted in Table 4.

In order to solve the third problem, it is necessary to ensure that cost information is objectively presented in space and time. Accounting security is of particular importance for the management mechanism. Ya. Ishchenko (2016b) notes: «The concept of information security is broader and includes all the information used in the management system. As well as a complex of information technologies, hardware and software to ensure the receipt, processing and movement of information flows, while accounting and analytical support is an integrated accounting and analysis system that systematizes information to substantiate business strategy, coordinate directions of prospective development of the enterprise, systematic evaluation of the effectiveness implementation of tactical and strategic management decisions».

External information does not reflect the performance of an enterprise, but has a significant impact on its activity, because the enterprise operates not within an isolated space, but within the country, industry, certain territory. External information includes indicators of macroeconomic development of a country or industry; indicators that characterize the activities of counterparties and

Table 4:
Influence of organizational and technological features of biological transformations in fisheries on accounting of cost management

Features of accounting organization	Characteristics of the cost management accounting system
General features of fisheries as an industry	
1. Territorial location of the enterprise	Due to the number of days with moderate air temperature, water quality, the nature of soils, the natural fish productivity of the ponds depends on the reduction of the costs volume per unit of production.
2. Seasonality	Cost accounting in accordance with the stages of technological processes: 1) preparation for stocking; 2) stocking; 3) cultivation; 4) rounds, etc.
3. Number of production cycles	Depending on the length of the production cycle (2-year or 3-year), full-scale fisheries can calculate the cost of 1-year and 2-years.
4. The finished product is a special type of assets - biological assets	Organization of accounting of finished products (fries, commercial fish) and changes occurring in the process of biological transformation (increase in live weight).
Production and technological features	
1. Type of farm	The presence of several cost accounting and costing items (fries, commercial fish). Organization of cost accounting in accordance with the stages of technological processes with increasing results. The presence of work in progress (the cost of this year's wintering joints). Organization of cost accounting using a detailed system of analytical accounts. Allocation of costs of basic, auxiliary and service industries.
1.1 Complete system	
1.2 Incomplete	Keeping records in one analytical account without division into technological groups. No work in progress. Applying one-tier method of cost accounting.
2. Form of reference	
2.1. Extensive	There are no separate costs (feed, fertilizers).
2.2. Semi-intensive	Few feed costs (cost of grain waste from harvesting).
2.3. Intense	Significant increase in the share of costs for feed, fertilizers, aeration of water, mechanization of production processes and other measures aimed at improving fish productivity.
3. Method	
3.2. Monoculture	Cost attribution for one species (breed) of farmed fish.
3.2. Polyculture	When calculating the cost, there is a problem of choosing a method of cost sharing between different species (species) of fish. Wide range of material resources used in production.
4. Species composition of fish	The presence of specific types of costs associated with the individual biological characteristics of individual fish species.

Source: Compiled by the authors based on findings by N. Vdovenko et al. (2007, 2017), M. Pravdiuk (2005), and O. Busenko (2005)

competitors; marketing research information. Internal management information system is formed through the planning, accounting and analysis of the enterprise (Figure 7).

Ya. Ishchenko (2016b) indicates that cost accounting in a management system is the process of obtaining, preparing, and transmitting cost information used by management to plan and control production situations and assess possible development trends within an organization.

It should be noted that the surveyed countries have introduced accounting for agricultural activities under IAS 41. However, in Poland, the Ministry of Agrarian Policy has undertaken the task of promptly bringing fair prices to each farmer. Whereas Belarus and the Czech Republic did not dare to take such a radical step as a complete abandonment of cost estimation. So, in Ukraine, it was decided to keep the cost estimate as a possible alternative valuation (V. Zhuk, 2007). There is therefore a need to account for direct and indirect costs of production. The algorithm for obtaining direct cost information in their exclusive presence is as follows: «Cost accounting object → direct cost information → general production cost information». Obtaining information on indirect unit costs is a more laborious process and requires a justification of the method for allocating such costs.

In fisheries, when growing products in monoculture, the share of direct costs will exceed the share of general production costs (overhead costs), and when growing in polyculture, a significant share of costs will be the overhead ones. IAS 2 - «Inventories» provides periodic distribution of overhead costs at the end of each calendar month. We propose to distribute the production costs of fisheries at the end of each stage of biological transformation. This will allow you to reliably determine the cost of the finished product or biological asset that is obtained upon completion of the production redistribution.

The procedure for allocating overhead costs is shown in Figure 8.

The algorithm for obtaining overhead costs is illustrated with a numerical example in Table 5.

In Table 5, the cost of fish-stock material for the stocking of a pond with an area of 20 hectares has been calculated according to the scheme of polyculture cultivation for the natural-climatic zone, characterized by an air temperature above 15 °C during the year 106-120 days (Ukraine - Forest-steppe). The calculation was made in accordance with the National Bank of Ukraine exchange rate USD 1 = UAH 27.42. The cost of fish-stocking material is the direct costs incurred in producing a particular product. The planting density is calculated for production at normal capacity.

The rest of the costs that will be incurred during production will be considered as overhead costs. The volume of such costs is directly proportional to the volume of production of commodity products. The consumption of feed and the protection of fish against disease, as well as the cost of loading and transportation when changing the location of fish products, depend on its quantity in natural meters. Cost will not be a factor in the impact of overhead costs.

Therefore, it is advisable to consider the total volume of production in natural meters as the basis for the distribution of indirect costs of fisheries.

We propose to calculate the share of the distribution base of individual accounting entities in the total volume of the distribution base by dividing a particular type of production by the total volume of manufactured products in natural meters (Table 6).

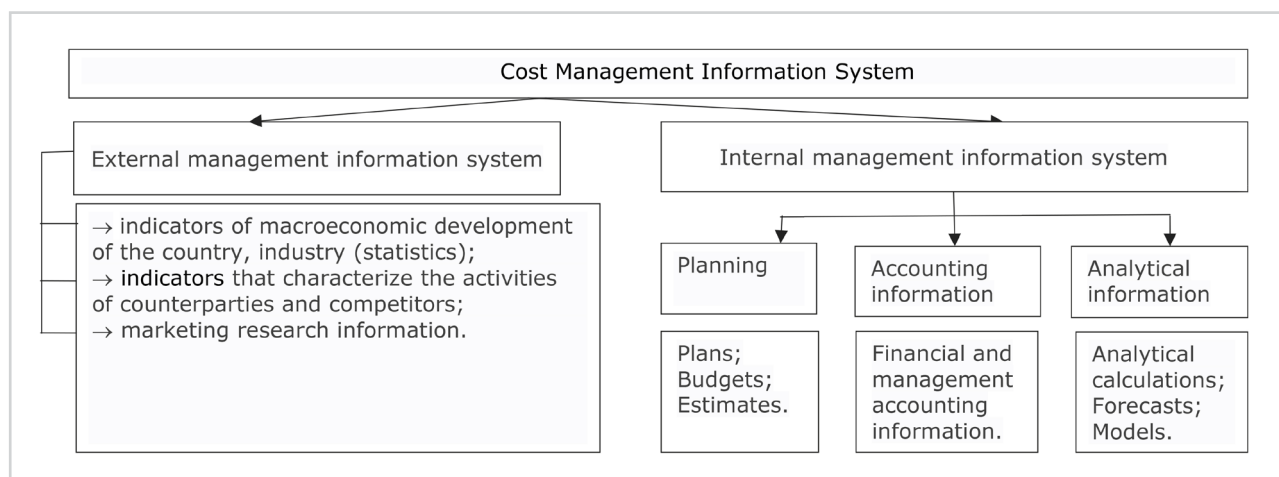


Figure 7:
Structure of information support of cost management
Source: Ya. Ishchenko (2016b)

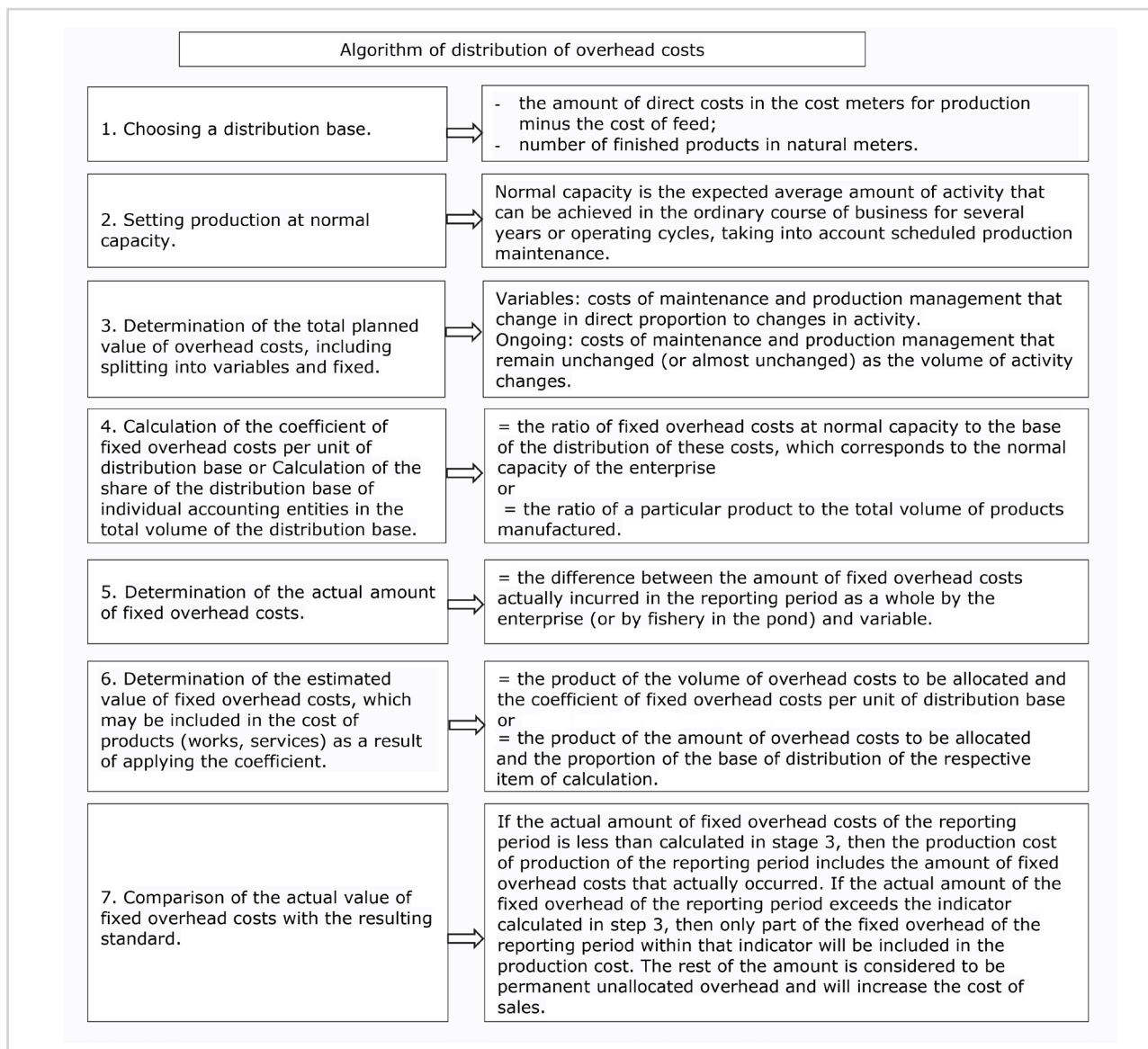


Figure 8:
Procedure for allocation of overhead costs in fishery
Source: Accounting Standard 16 «Costs»

Table 5:
Calculation of the cost of fish-stocking material for stocking

No.	Type of fish	Fish age, years	Density, thousand pieces / 20 ha	The total volume, kg	Price, USD	Cost, USD	Average final weight of 1 individual, kg	Output, %	Fish products, kg / 20 ha
1	Carp	1	30	750	1.53	1148.80	0.400	80	9600
2	Silver carp	1	40	1000	1.46	1458.79	0.400	80	12800
3	White cupid	1	4	120	0.84	100.66	0.400	80	1280
4	Pike	larvae	2	80	2.55	204.23	0.250	30	300
Total	X	X	X	X	X	2912.47	X	X	X

Source: Calculated by the authors

Table 6:
Calculation of the cost of farmed fish in polyculture

No.	Type of fish	Fish products, kg / 20 ha	Specific gravity (base of distribution)	Price, USD	Cost, USD	Costs at the point of sale, USD
1	Carp	9600	0.0400333	1.28	12253.83	-
2	Silver carp	12800	0.533778	1.09	14004.38	-
3	White cupid	1280	0.053378	0.84	1073.67	-
4	Pike	300	0.012510	1.82	547.05	-
Total	X	23980		X	27878.92	1557.99

Source: Calculated by the authors

Fixed overhead costs for fish production in polyculture are: depreciation of fixed assets, share of the cost of renting hydraulic structures, costs of labour of fish farmers and security guards at the ponds and accrual to the payroll fund (total USD 23380.11 see Table 7). The standard volume of these costs at normal capacity is USD 23705.32. When comparing the normative and actual index of fixed overhead costs, it is concluded that fixed overhead costs are subject to distribution in full, since their amount at actual capacity was less than the standard indicator.

Management accounting for the cost of producing fish is shown in Table 7.

Using this methodology will ensure that one of the functions of management accounting is to provide objective information about the cost of production for a particular type of product. As a result, management will be provided with information on the production cost of each type of production in the polyculture. This segment of information will provide objective pricing and the ability to analyze the efficiency of production of each type of fish products.

Table 7:
Accounting for general production costs, USD

Type of Costs	Cost Articles	Manufacturing «Carp»	Manufacturing «Silver carp»	Manufacturing «White Cupid»	Manufacturing «Pike»
Direct	Cost of fish material	1148.80	1458.79	100,66	204,23
Normative fixed overhead costs		23705,32			
Constant general production	Depreciation of fixed assets	137.86			
	Share of the cost of renting hydraulic structures	547.05			
	Costs of labour of fish farmers and guards	18602.63			
	Payments to the payroll fund (22%)	4092.58			
All incurred constant overhead costs		23380.11			
General production variables	Material costs (including protection. feed)	5689.28			
	Labour costs of workers when changing the location of fish products	688.99			
	Payments to the payroll fund (22%)	151.58			
	Losses within the natural loss (10% of the amount earned)	291.25			
All incurred variable overhead		6821.09			
Production at normal capacity	kg	9600.00	12800.00	1280.00	300.00
	USD	12253.83	14004.38	1073.67	547.05
Calculation of the share of the distribution base of individual accounting entities in the total volume of the distribution base		0.400334	0.533778	0.053378	0.012510
Distributed fixed overhead costs		9359.85	12479.79	1247.98	292.49
Distributed variable overhead costs		2730.71	3640.95	364.10	85.33
Total production costs for certain types of products		13239.36	17579.52	1712.74	582.05

Source: Calculated by the authors

5. Conclusions

According to the results of the study, it is concluded that the main problem regarding the accounting and analytical support of biological transformations in fisheries is the lack of theoretical substantiation and the imperfection of the methodology of accounting management of the costs of biological transformations in the field. The basic condition for effective management of costs for the production of fishery products and providing accounting information about them is the existence of sound accounting methodology for managing the costs of biological transformation.

Controlled (relevant) segments in the fisheries sector are identified to solve the problem, with their simultaneous division into separate production processes (redistributions). The application of the proposed classification of production redistribution will improve the system of synthetic and analytical accounting of biological assets and biological transformations and will provide information needs of managers. The influence of organizational and technological peculiarities of the aquaculture production process on the construction of the accounting system of fishery enterprises has been investigated, which gives the opportunity to develop and implement an adequate accounting system of cost management at the enterprises of the branch.

It is stated that the main prerequisite for effective cost management is the objective display of cost information in space and time. It is suggested that the cost of production of fishery products should be apportioned at the end of each production redistribution. At the end of the calendar year, the costs of each redistribution, the cycle of which has not been completed, shall be considered as an unfinished production of the fisheries industry. The expediency of accepting the total volume of production in natural meters as the basis for the distribution of indirect fisheries costs is substantiated.

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