

ΛΌΓΟ

Σ

DIE KUNST DES WISSENSCHAFTLICHE DENKEN

DER SAMMLUNG WISSENSCHAFTLICHER ARBEITEN

ZU DEN MATERIALIEN DER INTERNATIONALEN WISSENSCHAFTLICH-PRAKTISCHEN KONFERENZ

TENDENZE ATTUALI DELLA MODERNA RICERCA SCIENTIFICA

5. JUNI 2020 • STUTT GART, DEU 

BAND 3



DOI 10.36074/05.06.2020.v3
ISBN 978-3-471-37221-0



EUROPEAN
SCIENTIFIC
PLATFORM

ΛΟΓΟΣ

DER SAMMLUNG WISSENSCHAFTLICHER ARBEITEN

ZU DEN MATERIALIEN DER INTERNATIONALEN
WISSENSCHAFTLICH-PRAKTISCHEN KONFERENZ

**«TENDENZE ATTUALI
DELLA MODERNA RICERCA
SCIENTIFICA»**

5. JUNI 2020

BAND 3

Stuttgart • Deutschland

E
S
P

UDC 001(08)
T 35

<https://doi.org/10.36074/05.06.2020.v3>



Vorsitzender des Organisationskomitees: Holdenblat M.

Verantwortlich für Layout: Kazmina N.

Verantwortlich für Design: Bondarenko I.

T 35 Tendenze attuali della moderna ricerca scientifica: der Sammlung wissenschaftlicher Arbeiten «ΛΟΓΟΣ» zu den Materialien der internationalen wissenschaftlich-praktischen Konferenz (B. 3), 5. Juni, 2020. Stuttgart, Deutschland: Europäische Wissenschaftsplattform.

ISBN 978-3-471-37221-0

DOI 10.36074/05.06.2020.v3

Es werden Thesen von Berichten und Artikeln von Teilnehmern der internationalen wissenschaftlich-praktischen Konferenz «Tendenze attuali della moderna ricerca scientifica», am 5. Juni, 2020 in Stuttgart vorgestellt.



Die Konferenz ist im Katalog internationaler wissenschaftlicher Konferenzen enthalten. genehmigt von ResearchBib und UKRISTEI (Zertifikat № 270 vom 19.03.2020); ist von der Euro Science Certification Group zertifiziert (Zertifikat № 22154 vom 08.05.2020).

Konferenz Tagungsband sind gemäß der Creative Commons Attribution 4.0 International License (CC BY 4.0) öffentlich verfügbar.



Bibliografische Beschreibungen der Konferenz Tagungsband sind von CrossRef, ORCID, Google Scholar, ResearchGate, OpenAIRE und OUGC werden indiziert.

UDC 001 (08)

ISBN 978-3-471-37221-0

© Team der Konferenzautoren, 2020
© Europäische Wissenschaftsplattform, 2020

СПІРОМЕТРІЯ ЯК МЕТОД ДІАГНОСТИКИ ХРОНІЧНОГО ОБСТРУКТИВНОГО ЗАХВОРЮВАННЯ ЛЕГЕНЬ Гуманець К.Р., Марченко І.О., Сухова В.Р.	59
---	----

ABSCHNITT IX. TECHNISCHE WISSENSCHAFTEN UND IT

3D-МОДЕЛИРОВАНИЕ ЗАКРУЧЕННЫХ ПОТОКОВ В ТРУБАХ С ЛЕНТОЧНЫМИ ВИНТООБРАЗНЫМИ ВСТАВКАМИ Денисенко А.И., Пархоменко Л.А.	63
--	----

BLOCKCHAIN TECHNOLOGY. GREAT PROSPECTS VS CONFLICT OF INTERESTS Kovach V.	65
--	----

DAPPER AS ONE OF THE MOST POWERFUL ORM ON THE ASP.NET PLATFORM Гулієв Н.Б., Сайчишина Н.С.	67
---	----

EFFICIENCY OF STATISTICAL METHODS OF REDUCING THE DIMENSION OF GEOLOGICAL AND GEOPHYSICAL ATTRIBUTES FOR EXPLORATION OF PROSPECTIVE HYDROCARBON DEPOSITS Krasnyuk M., Krasniuk S.	69
---	----

IMPLEMENTING ELLIPTIC CRYPTOGRAPHY TO CREATE AN ELECTRONIC DIGITAL SIGNATURE Filat O., Yemeljanenko T.	71
---	----

INCREASING ZINC CONTENT IN CAKE PRODUCTS Stolyarchuk V., Dudnyk S.	74
--	----

INFORMATION TECHNOLOGY FOR CALCULATING MATHEMATICAL MODELS OF DYNAMICS OF TWO POPULATIONS Думова Н., Думов В.	75
--	----

NON-SPECIALIZED VESSEL ACQUISITION AND OPERATION PROJECTS, CONSIDERING THEIR SUITABILITY FOR OVERSIZED CARGO TRANSPORTATION Malaksiano M.	79
---	----

OPTIMIZATION OF OPERATION MODES BULK ELECTRIC POWER GRIDS Samsonov D., Kuchansky V.	83
---	----

PECULIARITIES OF ELECTRODE DROPLET TRANSFER CONTROL DURING OVERLAYING WELDING WITH A STRIP ELECTRODE Ivanov V., Lavrova E.	86
---	----

SYMMETRIC AND ASYMMETRIC ENCRYPTION Гулієв Н.Б., Волоховський В.Є.	88
--	----

VERNAM CIPHER Фрегер О.Є., Авдєєв О.Д.	91
--	----

buckwheat flour have a higher protein content with the best amino acid content [4-5]. It is known that the combined consumption of zinc with proteins promotes its better absorption [6].

Thus, the introduction of new cake products of pumpkin seeds and buckwheat flour to replace traditional raw materials will increase zinc in combination with other biologically active components. Consumption of new flour confectionery products will have a positive effect on strengthening human immunity, which is especially important in today's complex environmental conditions.

References:

- [1] Wessels, I., Maywald, M., Rink, L., (2017) Zinc as gatekeeper of immune function. *Nutrients*, (9), 1-44.
- [2] Ananda S. Prasad, Discovery of Human Zinc Deficiency: Its Impact on Human Health and Disease, *Advances in Nutrition*, Volume 4, Issue 2, March 2013, Pages 176–190, <https://doi.org/10.3945/an.112.003210>
- [3] Analysis of the confectionery market of Ukraine. Pro-Consulting. (2018) Retrieved from <https://pro-consulting.ua/ua/pressroom/vozvrashenie-k-sladoj-zhizni-analiz-rynka-konditerskih-izdelij-ukrainy>.
- [4] Stolyarchuk, V. & Dudnyk S. Die Benutzung von Oelsamen in der Feinbackwarentechnologie *European Science and Technology materials of the XIII international research and practice conference* (pp. 133-136) April 20-21, 2016, Germany, publishing office Vela Veriag Waldkraiburg.
- [5] Kaplina, T. V., Stolyarchuk, V. M., Ovchinnikova-Dudnyk, S. O., Brovko E. M. (2015) Innovative technologies of flour confectionery products using pumpkin seed processing products. Poltava: PUET. ISBN 987-966-184-216-7.
- [6] Antonyak, H., (2011) Biological role of zinc in humans and animals. *Animal biology*, (13, № 1–2), 18-31.

DOI 10.36074/05.06.2020.v3.32

INFORMATION TECHNOLOGY FOR CALCULATING MATHEMATICAL MODELS OF DYNAMICS OF TWO POPULATIONS

ORCID ID: 0000-0002-5294-1756

Hanna Dymova

Candidate of Technical Sciences, Phd., Associate Professor,
Department of Applied Mathematics and Economic Cybernetics
Kherson State Agrarian and Economic University

ORCID ID: 0000-0003-3556-8416

Volodymyr Dymov

Candidate of Technical Sciences, Phd., Associate Professor,
Department of Information Technology
Kherson National Technical University

UKRAINE

No organism can live in complete isolation from others, but, existing in one ecological niche, individuals often compete. The competition is due to limited resources such as food, space, water and so on. In some cases, one species may destroy the other for protection purposes rather than for use as a food source. The peculiar manifestations of interspecific interactions are illustrated by predator-prey and host-parasite systems, when one species serves as food for another.

The problem of population growth has begun to attract worldwide attention since Malthus proposed the "grim theory" in 1798. It notes that humanity can only survive

if periods of growth exponentially are interrupted by epidemics and natural disasters. In 1970, P.R. Ehrlich and A.H. Ehrlich in 1972, W.H. Meadows and others also examined exponential population growth and depletion of non-renewable natural resources [1, 2].

Models that describe, with a certain degree of accuracy, individual events relating to the growth of the number of species could be created. Models can be not only from a descriptive, empirical view, but also general purpose (R.M. May "Stability and Complexity in Model Ecosystems", 1972) [3]. This distinction is especially important in relation to specific applications. In 1972, G. R. Conway and G. Murdie in "Population Models as a Basis for Pest Control" described models that can be used to select pest control products [4]. The range of these models is relatively narrow: from auxiliary models that describe, for example, sexual and territorial behaviour, to models designed to describe very small fragments of the biological system. Models of this type are intended to answer questions regarding a particular species, and not to study general environmental laws. In the terminology of C. S. Holling from "The Strategy of Building Models of Complex Ecological Systems" (1966) and "The Tactics of Predator" (1968), such models are called "tactical" [5, 6].

The general strategic model creates a schema of the most important biological processes.

The purpose of the work is the implementation of the mathematical model of "predator-prey" in the form of a software application. The program should be able to monitor the dynamics of the population in the form of graphs of the number of predators and preys over time and a phase portrait of the system.

The host-parasite and predator-prey systems are examples of complex interactions when the development of an attacking species completely or partially depends on the number of individuals available to it used as a food source. The growth rate of the prey species depends on the number of individuals in a given population that are killed by a population of predators or parasites. The development of predator-prey models makes it possible to find out a number of important biological and mathematical properties of the system [7-10].

If we assume that the fertility of predators depends on the number of prey N_t and the mortality of prey is proportional to the number of predators, then the rate of change in populations will be determined by equations:

$$\frac{dN_t}{dt} = [r_n - c_1 P_t] N_t, \quad \frac{dP_t}{dt} = [-r_p + c_2 N_t] P_t, \quad (1)$$

called the Lotka-Volterra equations. They suggest that in the absence of predators the prey population has an exponential growth (according to T. R. Maltus) [7]

$$\frac{dN_t}{dt} = r_n N_t. \quad (2)$$

In equations (1) r_n is the intrinsic rate of increase in the prey population, which decreases (for each given moment in time t) depending on the size of the predator population P_t at the moment according to a linear law. Suppose that in the absence of a prey, predators die. Then their number decreases with speed $-r_p$. The latter is compensated by the multiplication factor c_2 for a separate individual with a total number of prey N_t [7, 8].

Consider the relation

$$\frac{dN_t}{dP_t} = \frac{[r_n - c_1 P_t] N_t}{[-r_p + c_2 N_t] P_t}, \quad (3)$$

which, after simplification, reduces to the following:

$$r_p \frac{dN_t}{N_t} - c_2 dN_t + r_n \frac{dP_t}{P_t} - c_1 dP_t = 0. \quad (4)$$

Integrating, we get

$$r_p \ln N_t - c_2 N_t + r_n \ln P_t - c_1 P_t = \text{const}. \quad (5)$$

Equality (5) corresponds to a set of closed curves connecting P_t and N_t (Fig. 1a), and the constant is determined only by the initial values of the numbers N_0 and P_0 . Reaching equilibrium when $dN_t/dt = dP_t/dt = 0$, correspond to the values

$$N = \frac{r_p}{c_2}, \quad P = \frac{r_n}{c_1}. \quad (6)$$

Thus, when the populations deviate from the equilibrium state, they do not return to it; their numbers fluctuate around equilibrium values (Fig. 1b). The oscillations continue indefinitely, with constant amplitudes determined by the initial values of the numbers, and the average values of the numbers are equal to the equilibrium [7, 8, 10].

$$\frac{1}{T} \int_{t_0}^{t_0+T} N_t dt = \frac{r_p}{c_2} \quad \text{та} \quad \frac{1}{T} \int_{t_0}^{t_0+T} P_t dt = \frac{r_n}{c_1}. \quad (7)$$

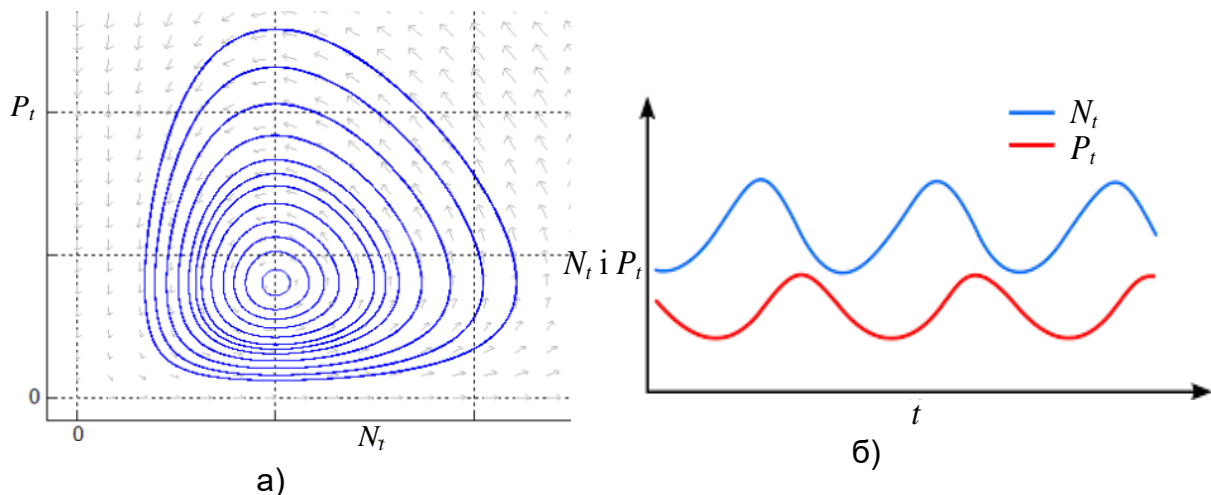


Fig 1. Change in predator and prey populations:
a) phase trajectories; b) the change in the number of predator and prey populations over time

To develop an information technology for calculating the dynamics model of two populations, the Delphi programming language was used [11, 12]. To calculate the model and obtain graphs of the number of populations and phase trajectories, it is necessary to enter the number of preys, predators and the number of calculation steps (Fig. 2). After that, you need to click the "calculate" button and get the result.

The program calculates step-by-step the population size (left) and shows the dependence of the number of predators and preys on time (right), as well as a phase

portrait - a sequential display of points corresponding to the state of the system in phase space. For the predator-prey model, the phase space can have two dimensions - the number of predators and the number of preys.

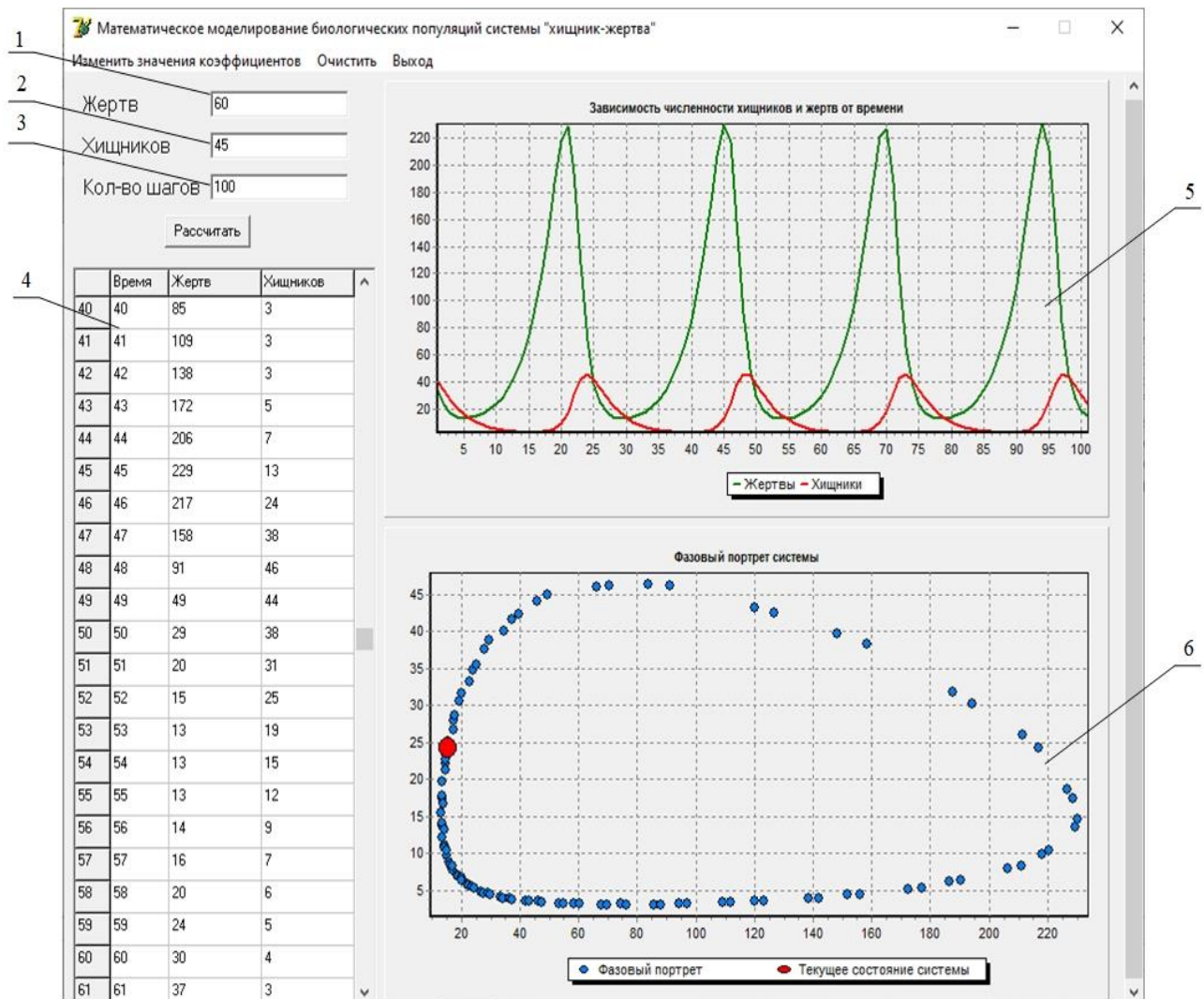


Fig 2. Software application for mathematical modeling of biological populations of the predator-prey system:
1 – number of preys; 2 – number of predators;
3 – number of calculation steps; 4 – step-by-step calculation;
5 – time dependence of predators (red) and preys (green);
6 – system phase portrait (blue - phase portrait, red - current state of the system)

Conclusions. The work describes the predator-prey system. Based on the mathematical model, a software application for calculating biological populations of the predator-prey system has been developed using Delphi programming language. The program has the ability to display the dynamics of the population in the form of graphs of the number of predators and preys in time and phase portrait of the system.

References:

- [1] Ehrlich, P.R. & Ehrlich, A. H. (1972). *Population, Resources, Environment, Issues in Human Ecology*. San Francisco: Freeman.
- [2] Meadows, W. H., Meadows, D. L., Randers, J., Behrens, W. W. (1972). *The Limits to Growth*. New York: Universe Books.

- [3] May, R. M. (1972). *Stability and Complexity in Model Ecosystems*. Princeton: Princeton University Press.
- [4] Conway, G. R. & Murdie, G. (1972). *Population Models as a Basis for Pest Control*. In J. N. R. Jeffers (ed.) *Mathematical Models in Ecology* (pp. 195-213). London: Oxford University Press.
- [5] Holling, C. S. (1966). *The Strategy of Biding Models of Complex Ecological Systems*. In K. E. F. Watt (ed.) *Systems Analysis in Ecology* (pp. 195-214). New York: Academic Press.
- [6] Holling, C. S. (1968). *The Tactics of Predator*. In T. R. E. Southwold (ed.) *Insect Abundance in Ecology* (pp. 47-58). London: Oxford University Press.
- [7] Мэрди, Дж. (1979). *Модели популяций*. Эндрюс, Дж. & Мак-Лоун, Р. *Математическое моделирование* (с. 109-127). Москва: Мир.
- [8] Вольтерра В. (1976). *Математическая теория борьбы за существование*. Москва: Наука.
- [9] Дымова А.О., Волкогон М.Ю. Исследование двухотраслевой экономической модели. *Матеріали VIII Міжнародної конференції з управління «Автоматика-2001»* (с. 44-45). 10-14 вересня, 2001. Одеса, Україна: ОДПУ.
- [10] Дымова А.О. Исследование устойчивости динамической системы двухотраслевого производства. *Матеріали X Міжнародної конференції з автоматичного управління «Автоматика-2003»*. (с. 38-40). 15-19 сентября, 2003. Севастополь, Україна: СевНТУ.
- [11] Delphi (язык программирования). Removed from [https://ru.wikipedia.org/wiki/Delphi_\(язык_программирования\)](https://ru.wikipedia.org/wiki/Delphi_(язык_программирования))
- [12] Delphi. Removed from <https://ru.wikibooks.org/wiki/Delphi>

DOI 10.36074/05.06.2020.v3.33

NON-SPECIALIZED VESSEL ACQUISITION AND OPERATION PROJECTS, CONSIDERING THEIR SUITABILITY FOR OVERSIZED CARGO TRANSPORTATION

ORCID ID: 0000-0002-4075-5112

Mykola Malaksiano

Ph.D. in Mathematics, Head of Department
of Technical Cybernetics and Information Technology prof. R.V. Merkta,
Odessa National Maritime University

UKRAINE

In view of growing competition in the freight market in recent years, shipowners are forced to take active measures aimed at improving the efficiency of their own fleet. In this connection, there is a need for a deeper analysis of the trends in the structure of freight flows and a more accurate choice of the fleet development strategy. Of great importance is timely replacement of vessels and replenishment of the fleet with such vessels, which would allow to work as efficiently and flexibly as possible in conditions of tough competition and uneven structure of cargo traffic.

The basic principles of modern oversized project cargo transportation, stowage and securing technologies are discussed in articles [1, 2]. The issue of optimum terms of purchase and sale of vessels and other equipment was considered in [3–7], taking into account the factor of uncertainty. The issue of optimal time to enter the shipping market was studied in [8–10]. One of the key methods aimed at shipping efficiency improvement is concerned with lowering fuel consumption by reducing ship speed. Papers [11, 12] examine the dependence of vessel's operation efficiency indicators on ship speed. The profitability of ship speed reduction and fuel consumption of seagoing bulk carriers was examined in [3, 8–12].