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«__»_____2019 .

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2019 .

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| 1. | - | 4 |
| 1.1 | | 4 |
| 1.2 | | 6 |
| 1.3 | | 12 |
| 1.3.1 | | 12 |
| 1.3.2 | | 16 |
| 1.3.3 | | 19 |
| 1.3.4 | | 20 |
| 2. | | 24 |
| 2.1 | | 25 |
| 2.1.1 | | 26 |
| 2.1.2 | | 28 |
| 2.1.3 | | 29 |
| 2.1.4 | | 30 |
| 2.1.5 | | 31 |
| 2.2 | ..... | 33 |
| 2.2.1 | ..... | 33 |
| 2.2.2 | ..... | 36 |
| 2.3 | ..... | 38 |
| 2.3.1 | ..... | 38 |
| 2.3.2 | ..... | 41 |
| 3. | ..... | 44 |
| 3.1 | ..... | 44 |
| 3.1.1 | ..... | 44 |
| 3.1.2 | ..... | 46 |
| 3.1.3 | ..... | 47 |
| 3.2 | | 48 |
| 4. | | 57 |
| 4.1 | | 57 |
| 4.2 | | 58 |
| 4.3 | | 61 |
| 4.4 | | 61 |
| | | 67 |
| | | 70 |

[3; 15].

[18; 5].

1.

2.

3.

4.

1. —

1.1

65

7-5

1.1).

[5].

3

(. 1.1) [5].

1,5

(. 1.1).

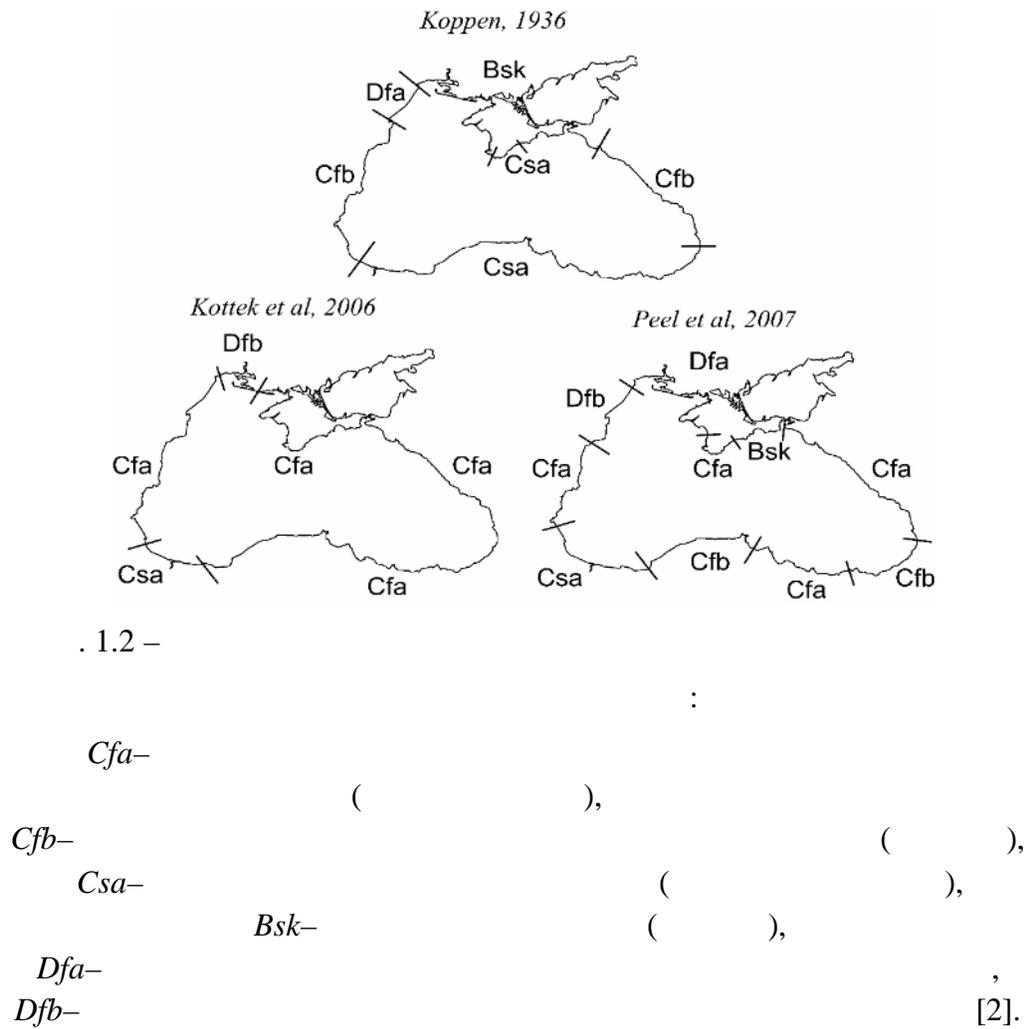
[5].

(. 1.1).

1.2

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[2].
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[2].
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[2].
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- [2].
-2°, - 0°,
- +5° [2].
5 / .
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6

22° - 25° [2].



1950–2000 . (.2 Kotteketal., 2006)

[2].

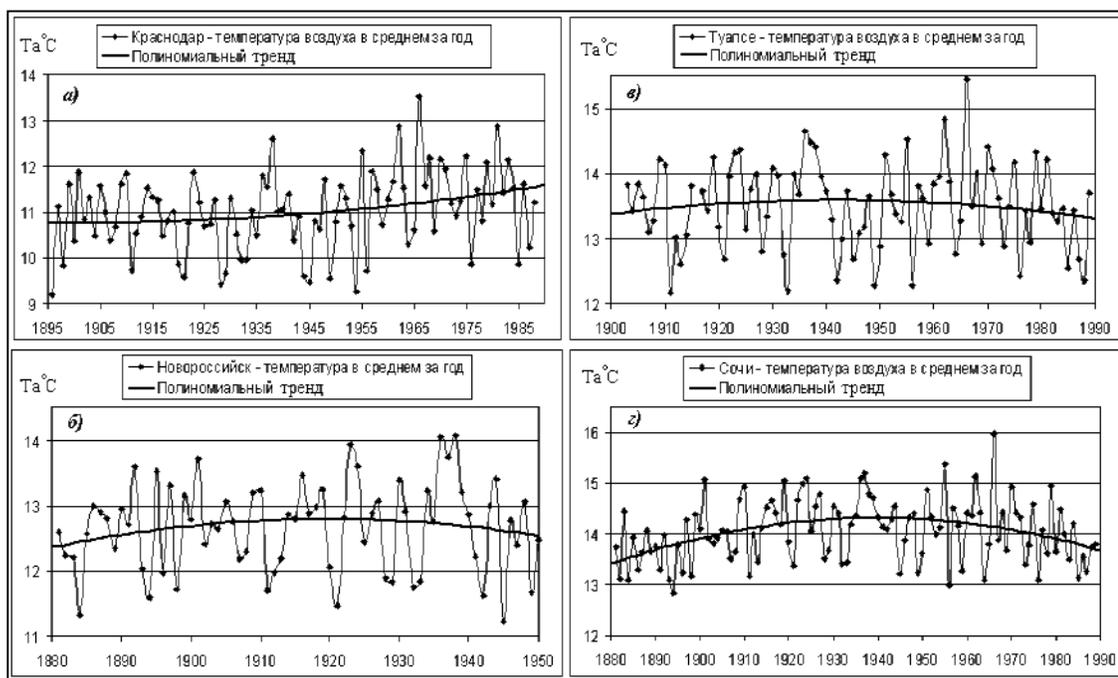
(.2 Peeletal., 2007).

) [8].

1.3.1 1.3.2

),
 .
 —
 (,)
 .
 1930 – , 1970– .
 , 1940 –

[22].



. 1.3.1 –

) – ;) – ;) – ;) – [22].

XX

1990– .

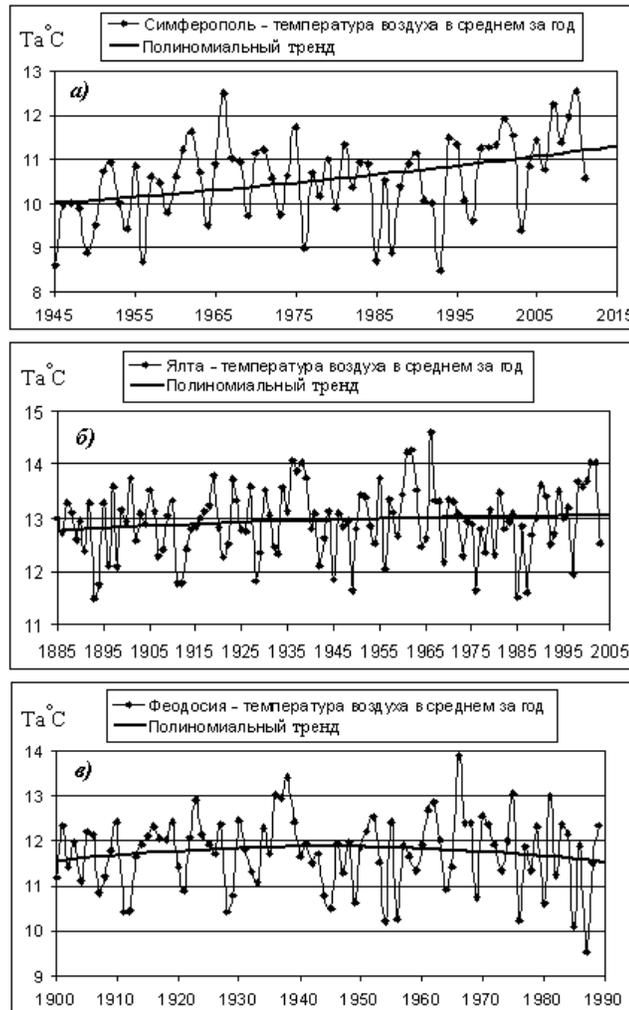
XX

1966 .

(+ 13,5, 15,9 15,4°).

[22].

200 [22].



. 1.3.2 –

) – ;) – ;) – [22].

(), 1.3.2,

1980– . 2011 .

1940– .

[22].

1966 .

12,5, 14,6 13,9° .

1934 1939 .

1980–

1990– .

1985, 1987, 1993 [22].

1960– .

1950–

1960– [22].

7 .

(. . .)

0,6°C 1,1°C.

[15; 28].

1.3

() .

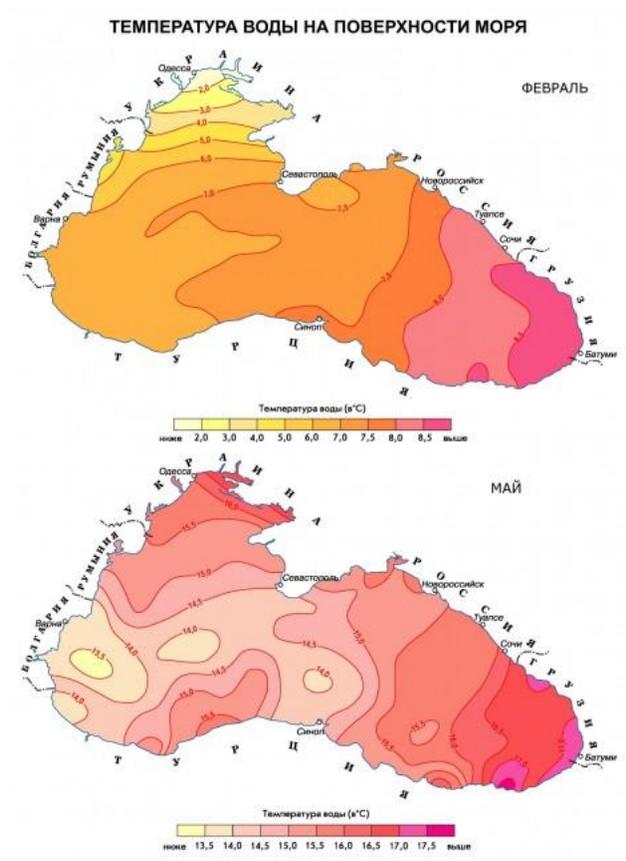
1.3.1

0.97° 28 – 29° (. 1.4).

8,96° .

[8].

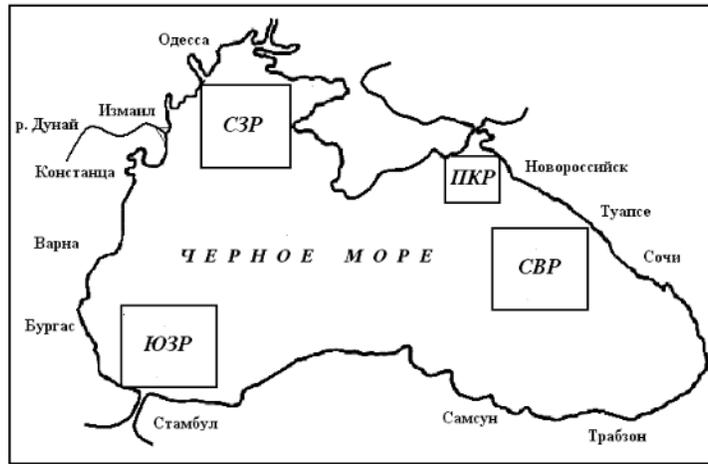
: 5 130 , , 15 – 20 , (), . . 30 – 100 . 9.1° [8].



. 1.4 – [24].

[8].

4



1.5.

. 1.5 –

1.6.1

1980 –

2010 (16 °), 1999,
2002, 2007 . 1954, 1976, 1987 .

1.6.2



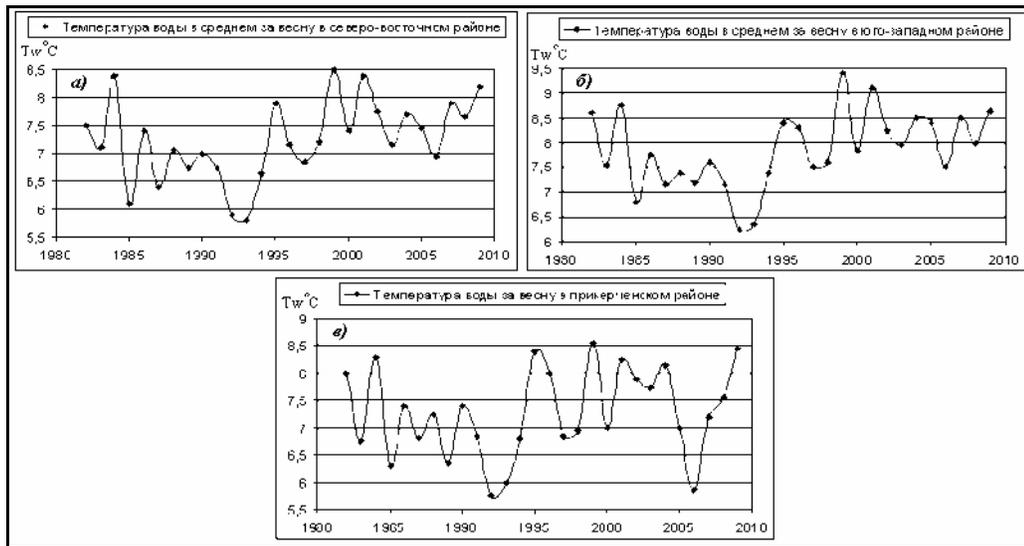
. 1.6.1 –

1984, 1999 2001.

1987 1994 .

2006 .

20° .



. 1.6.2 –

) – – ;) – – ;
) –

1.3.2

[8].

(. 1.7) [8].

17–18%

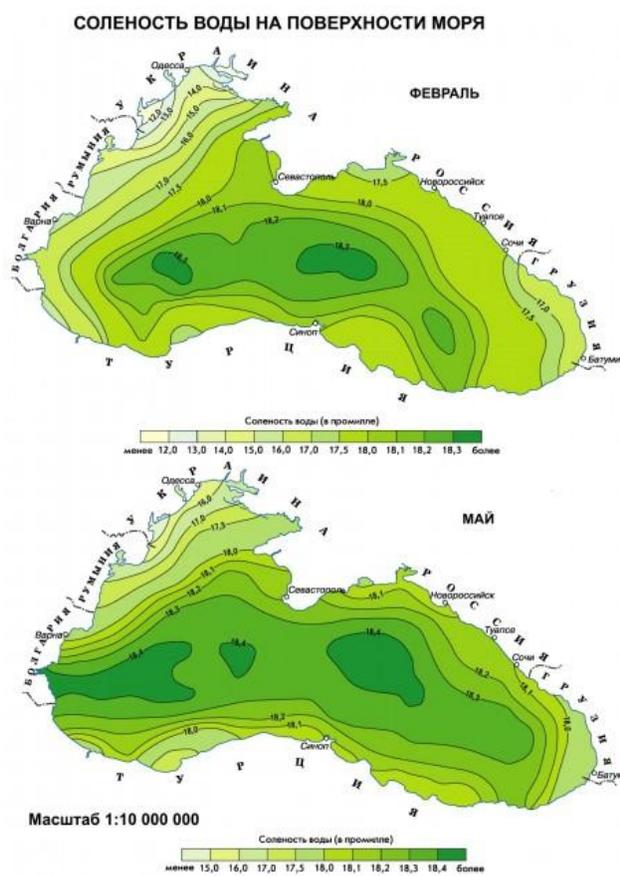
22,5%

18,5

21,0%.

(34 – 35%)

[8].



. 1.7 –

[24].

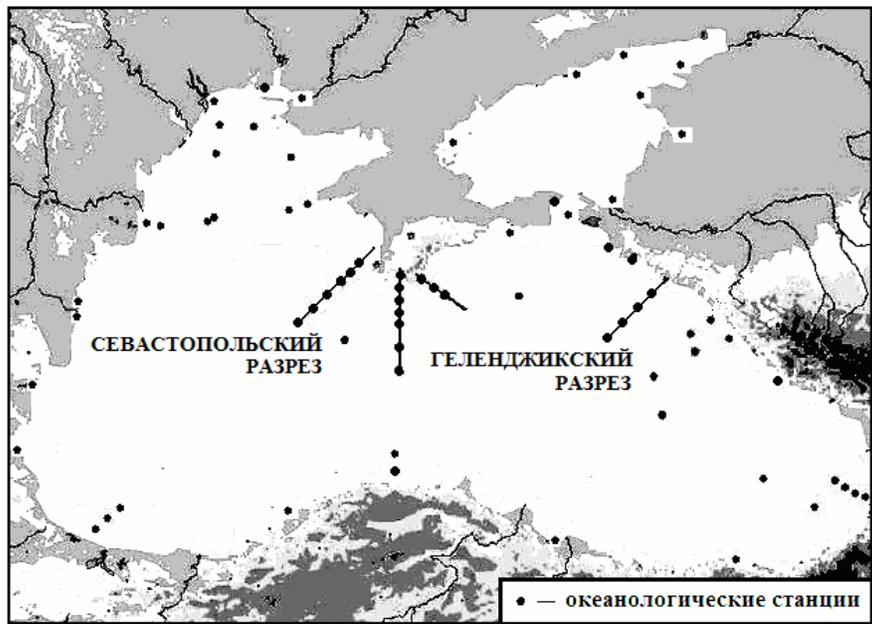
[8].

[8].

().

[8].

1.8



1.8 –

[24].

1.3.3

$$= 1012,6 \text{ / } ^3 [8].$$

,
.
.
:
0 – 100 5
/ ³.

20 – 30 .

150 – 200 .

[8].

[8; 11].

3,3 / ³.

[8].

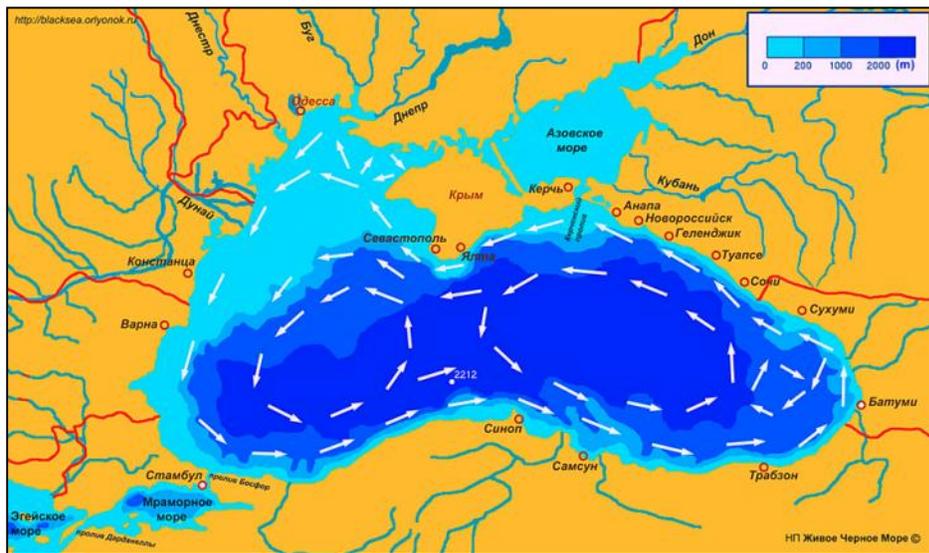
1.3.4

19 – –

20–
[8].

[8].

: (),
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(. 1.9). [8; 11].
()



. 1.9 –

[27].

30 / 60 / . ,

>140 / [11].

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(, ,),

[8].

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[8].

[8].

~ 60 ,

40-50 /

100-150 . [8].

160 ,

2 , 9 .

[8].

— ,
1.5 ,

. [8; 11].

) , ,
20 – 30 / ;
) , , 40 – 80
40 – 50 / , 1 – 1.5 / ;
) , , 5 – 15 / .

0.8 – 1.4 / ,
40 – 60 / [8].

10 / ,
40 / .
96 / 100 [8].

100 – 500 , ~ 4 [8].

300 .

2.

[5].

()

() [5].

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[5].

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2.1

(*Chondrichthyes*)

(*Osteichthyes*) .

184

,

144

, 24 –

(), 16 –

[4].

[20].

8

, 95

[20].

(*Engraulisencrasicholusponticus*),

(*Trachurusmediterraneusponticus*),

(*Psettamaeotica*),

(*Mugilidae*) .

, (, , .)
 [20].
 ,
 4 , ,
 :
 - (, ,);
 - , ();
 - (,);
 - (,);
 - (,) [4].

2.1.1

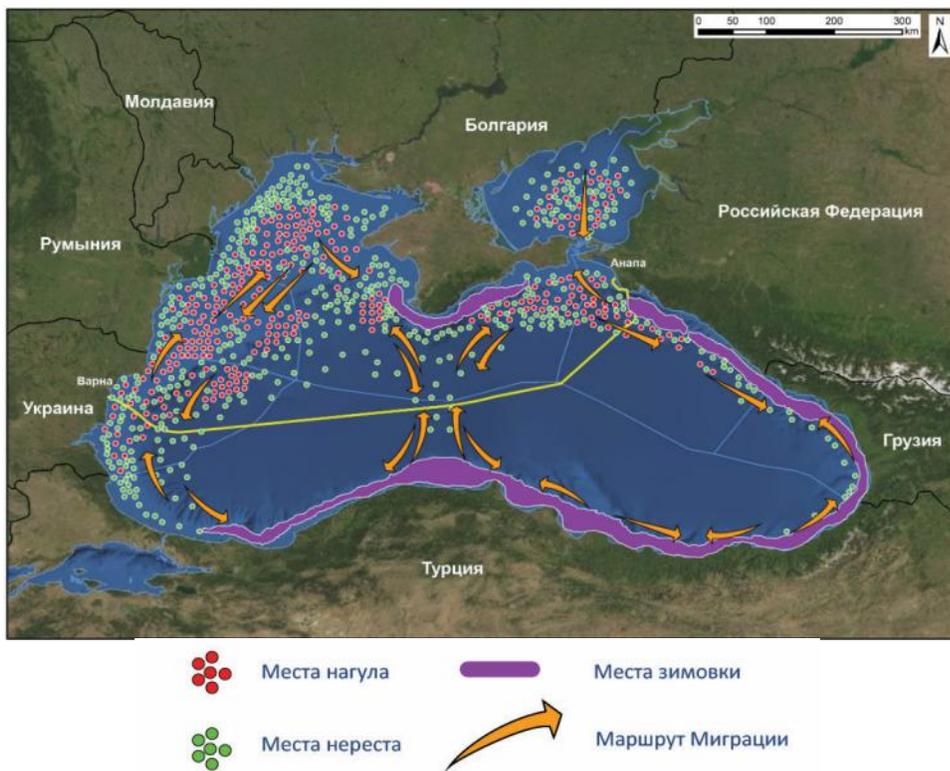
() (*Eugraulisencrasicolus*)

- .
 , .
 .
 10 – 12 ‰ () 17 –
 18 ‰ ().
 14 – 15 ° , -
 20 – 26 ° [4].

Mysidacea, *Copepoda*, *Cladocera*, *Cirripedia*, *Decapoda*, [4].

70 – 80 [12].

(. 2.1) [4].



. 2.1 –

[25].

[4].

2.1.2

(*SprattusSprattusphalericus*L.).

6–18 ° .

5

14 , – 25 .

[12].

(*lanushelgolandicus*)

(*Acartlaclausi*) [12].

(.2.2).

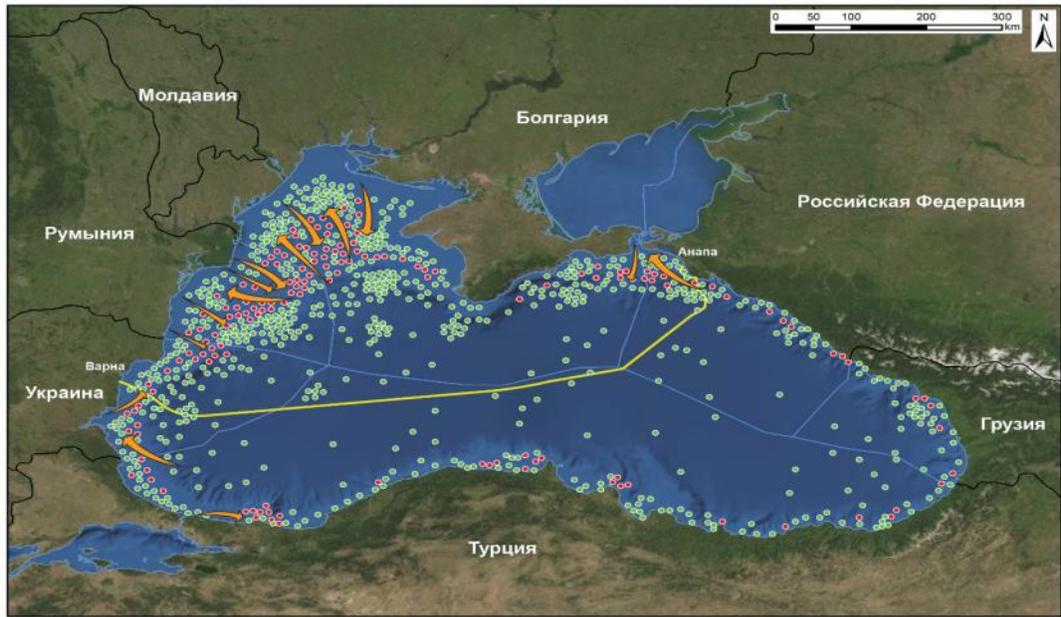
200 600 . .

1976 .

. [12]

30 %

44 % [12].



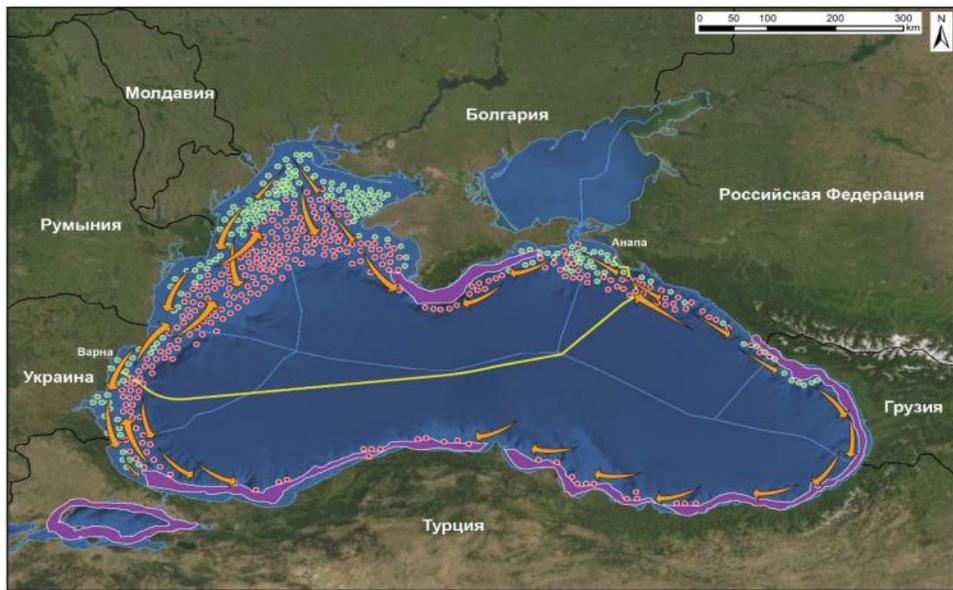
. 2.2 –

[25].

2.1.3

(Trachurus mediterraneus ponticus Alev)

,
 ,
 – « » « », 20
 , « » 55 [4].
 « »
 . « »
 . 6–25 °
 ;
 [4].
 – , .
 ,
 (2.3).



. 2.3 – , , [25].

, . [12].

1987 . ;

[7].

2.1.4

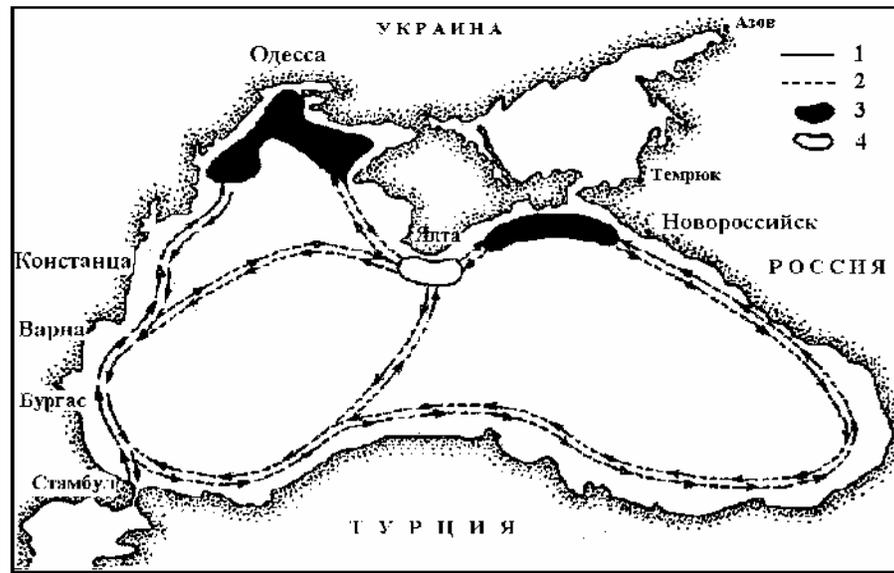
(*Scomberscombrus*)

5 . 30 .

8° 20°

[21; 4].

() (.2.4) [4].



.2.4 -

1 -

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; 2 -

; 3 -

; 4 -

[4].

2.1.5

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Mugiliformes ().

10

100

[4].

– (*Mugilcephalus*), (*. auratus*), (*. saliens*)
(*. soiuu*) [4].

[4].

() ,

[4].

– 16 – 25 ° ,

(75 – 80 %), (20 %)
(5 %) [4].

50 .) .

[4].

2.2

, , - . ,
95,3 . ² 23 % .
:
, - [20].
127 , - 143 , - 200
. 200 - ,
[20].

[18].

2.2.1

60

(, ,), ,

(, -).

- [12].

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4 :

,
[12].

-
[12].

,

.

(Phyllophora)

(Cystoseireta).

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()

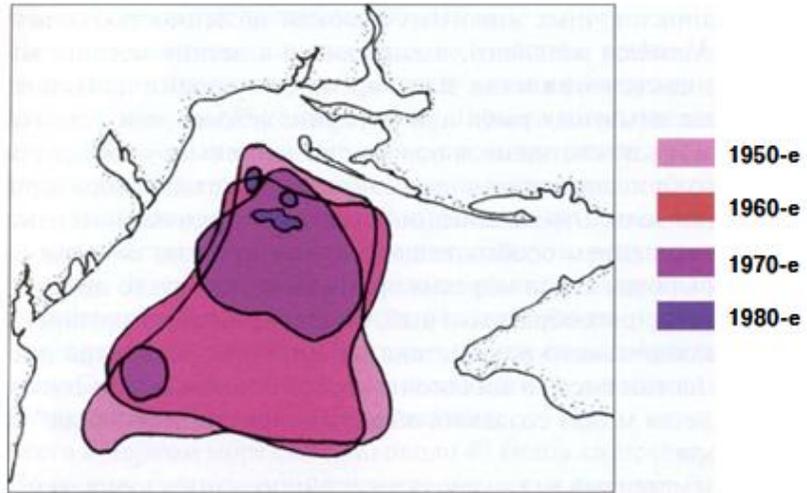
20-60 .
1970-1980-

1,7 / ²[12; 20].

,

-

(.2.5).



. 2.5 –

1950–1980– . [5].

80 – 100 %, 40 – 50 70 – 80 – 1,70 . 1 10 . 8,6 / ²[20].

80 – 100 %. 5–10 / ²[20].

(, , ,) [20].

[20].

2.2.2

1518

, 80 %

[12].

[12].

(0,1 1)

(0,1) [20].

[12].

[20].

23 %

120 –135 ,

- 165 ,

170 –200 [20].

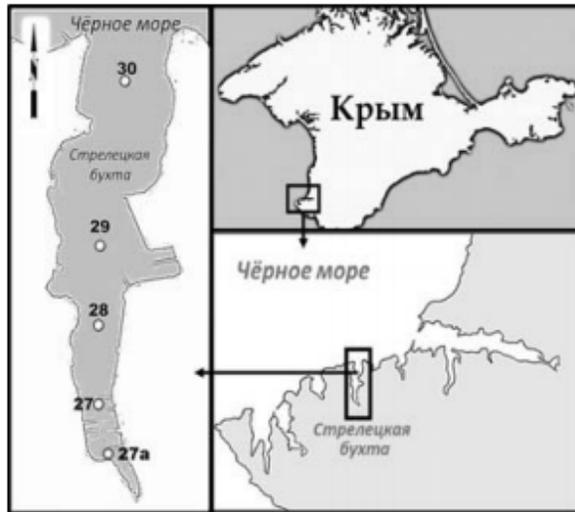
),

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,
.
- 420 [19].

2,2

[20].

2003 2015 .
(- (),
() ()
(.2.6) [20].
:



.2.6 – –

[19].

[20].

2.3

2.1.

().

2.3.1

750

(.2.7) [12].

:

, , , , ,
.
- [6].

(*Chaetoceros*,
Cerataulina, *Thalassionema*, *Melosira*, *Skeletonema*, *Nitzschia*, *Synedra*, *Navicula*)

.
- . ,
, , .

[20].

,
, , .

(,) -

(*Peridinium*, *Ceratium*, *Exuviaella*, *Dinophysis*, *Prorocentrum*, *Goniaulax*, *Glenodinium*,
Gymnodinium) [20].

: 1)

2)

3) -

, 4)

[5].

60- .

, 70- .-

- ,

, 80- .

- - [5].

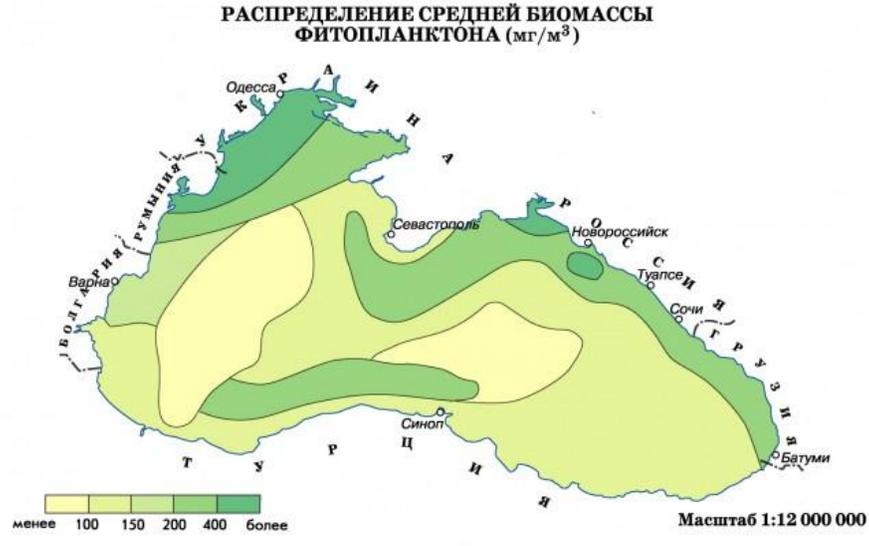
43%;

- 38%; 10%

; 5 %

; 3 % -

[5].



. 2.7 –

[24].

[5].

[5].

1.

[12].

100

50

[12].

[12].

2.3.2

120

20

(. 2.8) [12].



. 2.8 –

0–200

[24].

(*Tintinnoinea*),
,
(*Sagittasetosa*), (*Oikopleuradioica*),
(*Pleurobracliiapileus*) (*Aureliaaurita*, *Rhizosomapulmo*) [12].

(*Calanushelgolandicus*, *Pseudocalanuselongatus*, *Oithonasimilis*)
(*P.pileus*) [12].

[12].

(*lenterata*)
– (*Podocoryneearned*), (*Sarsiatubulosa*)
(*Obeliasp.*) [12].

Pilemapulma

Aureliaaurita [6].

(*Cnidaria*) –
(*Pleurobrachiapileus*),
(*Rotatoria*),

(*tellacochlearis*, *Synchaetabaltica*),
(*Annelides*) [20].

(70 – 90%)

;
(*Copepoda*)

, – *Cladocera*–
(–) [20].

[20].

[12].

(, , ,) ,

[12].

[20].

100–175 .

[20].

3.

3.1

1,

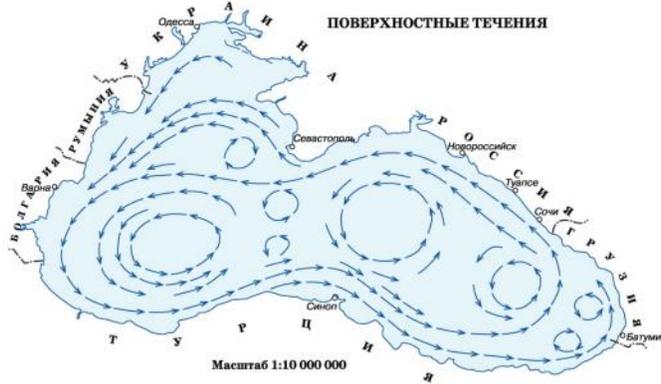
3.1.1

75-100 25-30

[12].

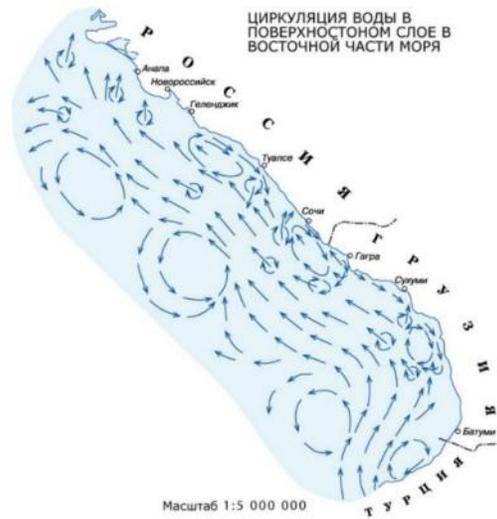
[8].

(. 3.1.1, 3.1.2).



. 3.1.1 –

[24].



. 3.1.2 –

[24].

[8].

3.1.2

1.

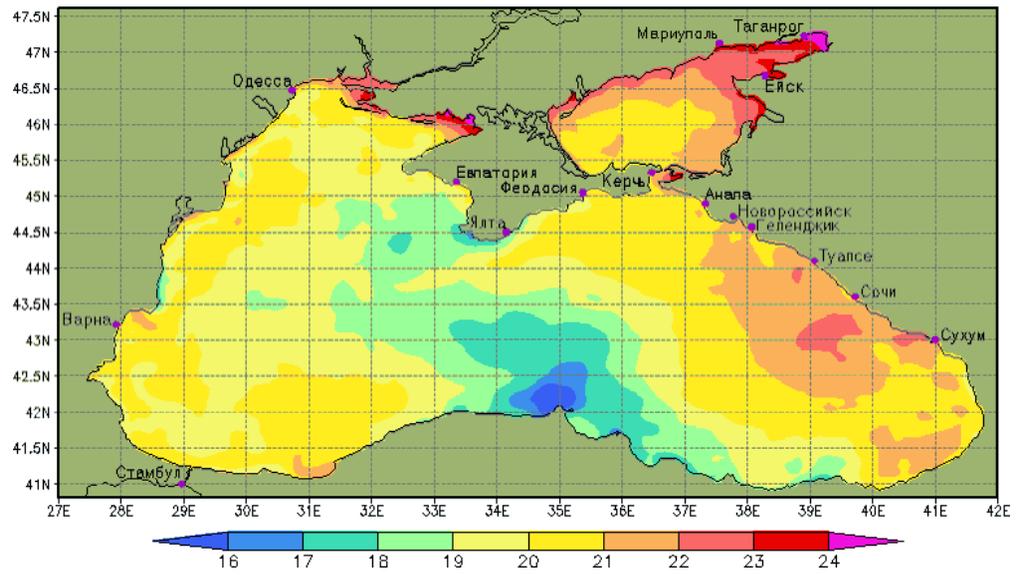
[12].

(8,9°)

[12].

200 (. 3.2) [12].

30.05.2019



. 3.2 –

30.05.2019 .

[26].

3.1.3

[12].

240 ,

, 340 ³

380 ³.

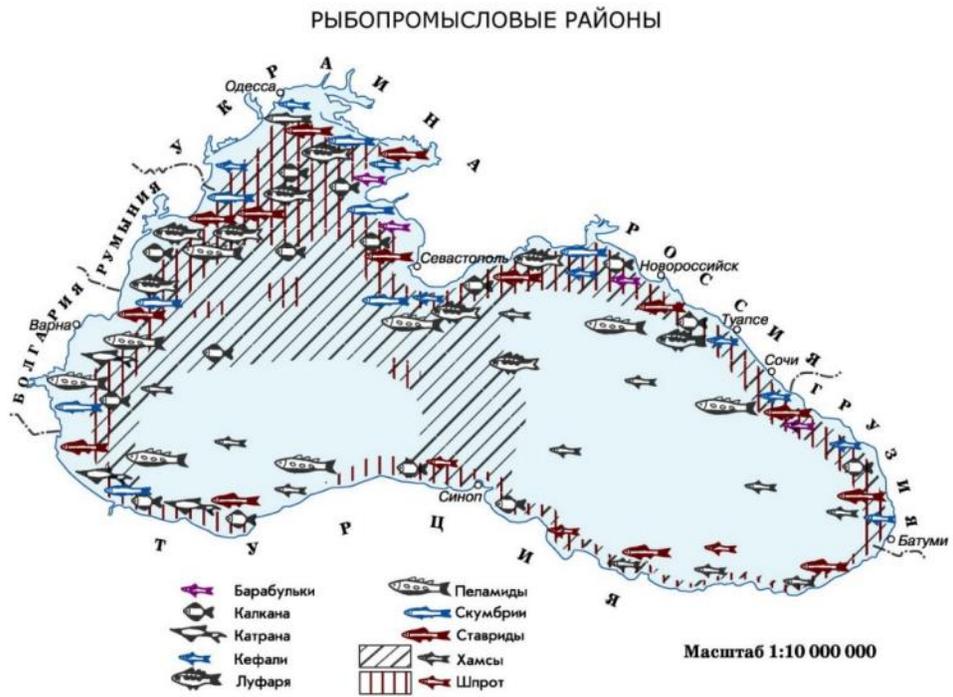
[12].

3.1.1.

3.2

2,

(. 3.3).



(The International Council for the Exploration of the Sea – ICES) (ICES 2014, b, 2015).

3.4



. 3.4 –

. 3.5.1, 3.5.2 3.5.3



. 3.5.1 –



. 3.5.2 –



. 3.5.3 –

($r=0,366$ $P= 99\%$). . 3.6.1

1

40 .)

(35 .
1992, 1993

155 .)

1998 1999 .

7,1 8,4 7,2 8,5 .

($r=0,330$ $P= 99\%$),

. 3.6.2.

(35 40 .)

1991, 1992 .

1 (80 155 .)

1983 1985 .,

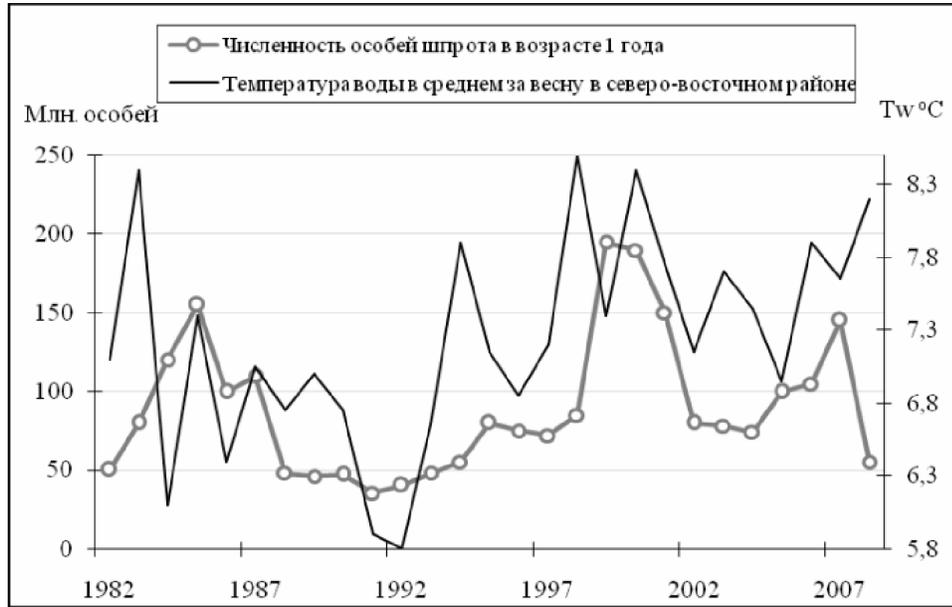
(85 195 .)

1999 2000 .

7,55 8,75 7,6 9,4 .

1

, $r= 0,325$ $P=99\%$.



.3.6.

1 –

1



. 3.6.2 –

1

- , r=0,327 P=99%,
 - , r=0,298 P=99%.

- ,

-

-

-

-

-

-

-

- , r=0,481 P=99%.

. 3.7 ,

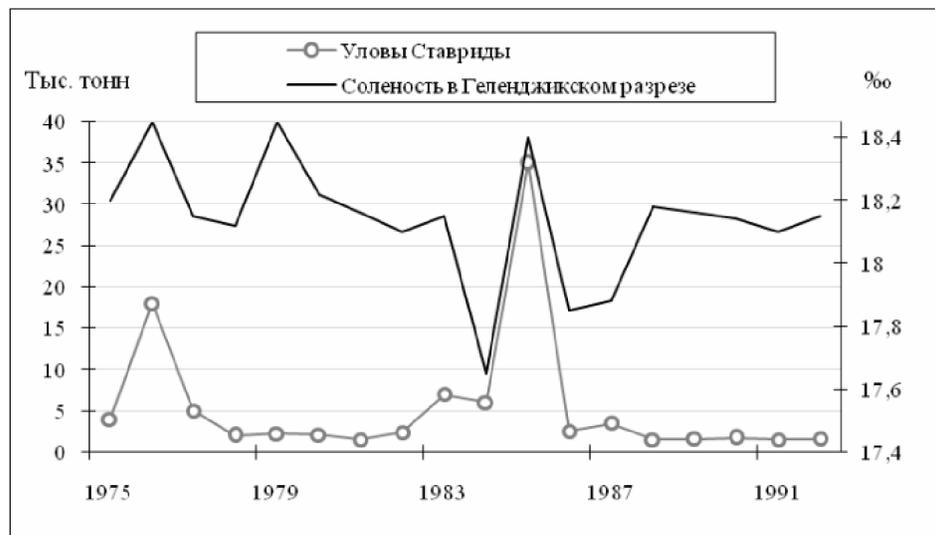
(0,40 0,45 .) 1997,
 1975, 1993 . (1,55 . 2,3
 .)

1984 1986 .,
 1978 . 6800³ 1982 . 7770³
 7250³ 1985 . ,

, $r=0,402$ $P=99\%$.
 . 3.8 ,
 (17,65 % 18,4 % 1984 . 1985 .),
 (6 . 35 . 1984 . 1985
).



.3.7 –



.3.8 –

4.

, . (.)
, - [3].

, [23].

, [23].

, , -
, ,
, .

4.1

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, , ,
, [5].

[5].

« » ,
(, ,
) , , ,
« » ,
[5].

4.2

1970– ..
10 40

[5].

[5].

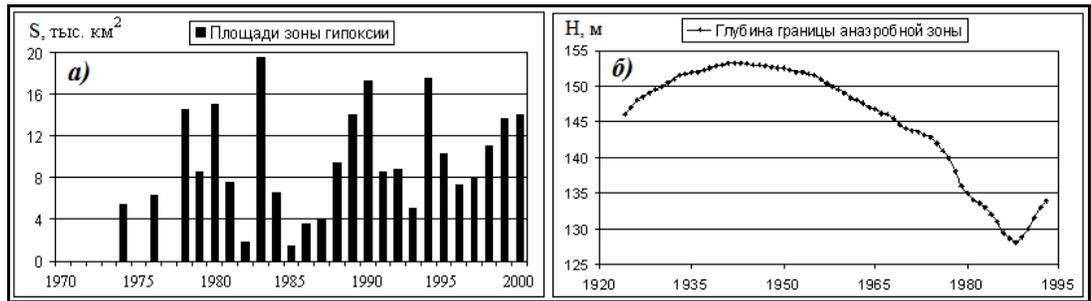
4.1

[13].

1978, 1980, 1983, 1989 –

1990 ., 1994 .
1990– .

1970– ., 1975, 1977, 1982 1985 .



. 4.1 –

) –

) –

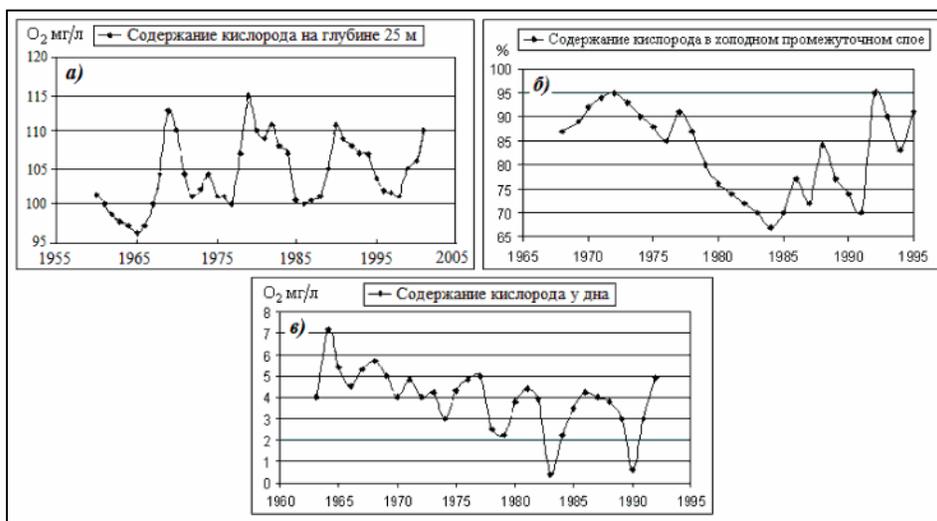
[14]

120 –150 ,

144 – 145

0,7 – 1,1 / .

0,4 / .



. 4.2 –

) – 25 ;
) – ;
) – .

. 4.2

[14].

10 – 12 .
 1965, 1975 – 1977, 1985 – 1988 1996 – 1998 .,
 – 1969, 1979, 1990 .

4.3

· ,
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·
·
·
·

[5].

XX

[5].

· 40-50- ·
10 200 1 · 60- ·
90 · 1 · 80 -
.- 140 · , 80- .- 250 · .

[5].

4.4

· ,
· ,
·
·

[5].

[16],

Fe, Mn, Co, Ni, Cu, Zn, Cd, Hg, Ag Au

[16].

40

18

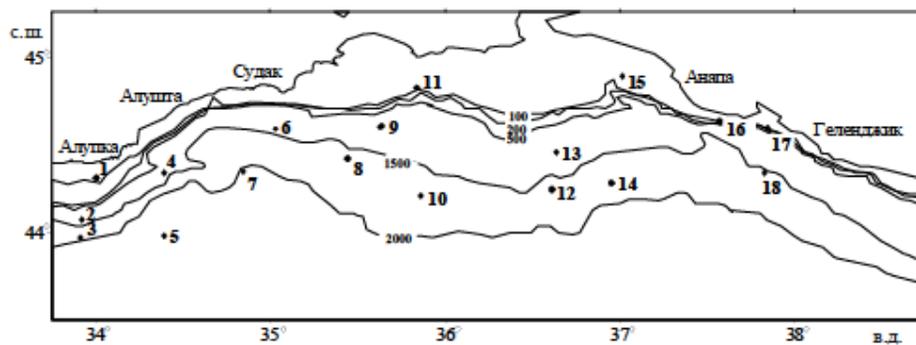
(. 1 – 11),

(. 12, 13, 15)

(. 14, 16 – 18)

(.)

. 4.3 [16].



. 4.3 –

[16].

Mn, Co Cu Fe.

Au/Cu Zn/Cu

Co/Fe Ni/Fe Mn/Fe Hg/Cu Ag/Cu Cu/Fe.

— [16].

, [17].

,4500 . 12 . . [5]. 80 .

[17].

(—), (—).

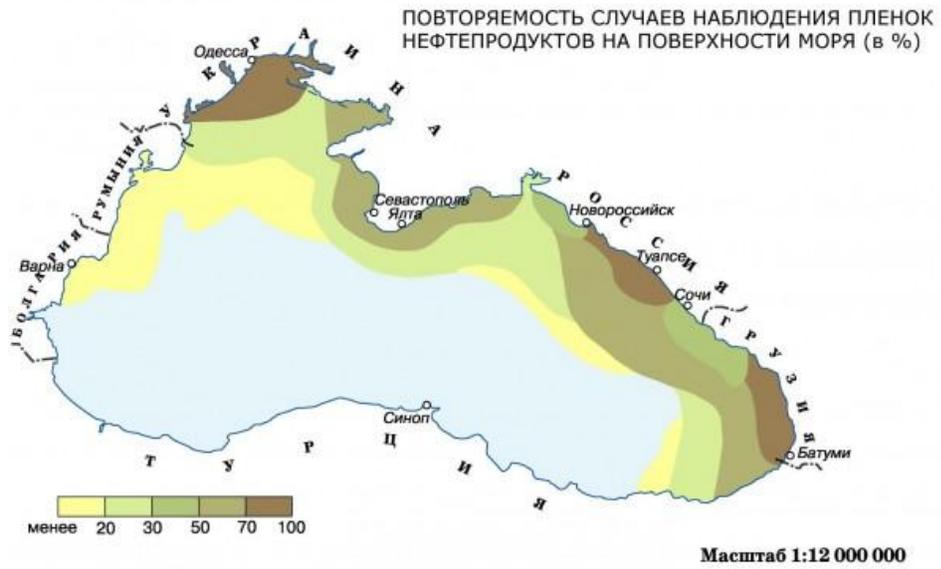
50 . [5]. 50 . , 100 (. 4.4).

: (. 4.5) [10].



. 4.4 –

« – » [10].



. 4.5 –

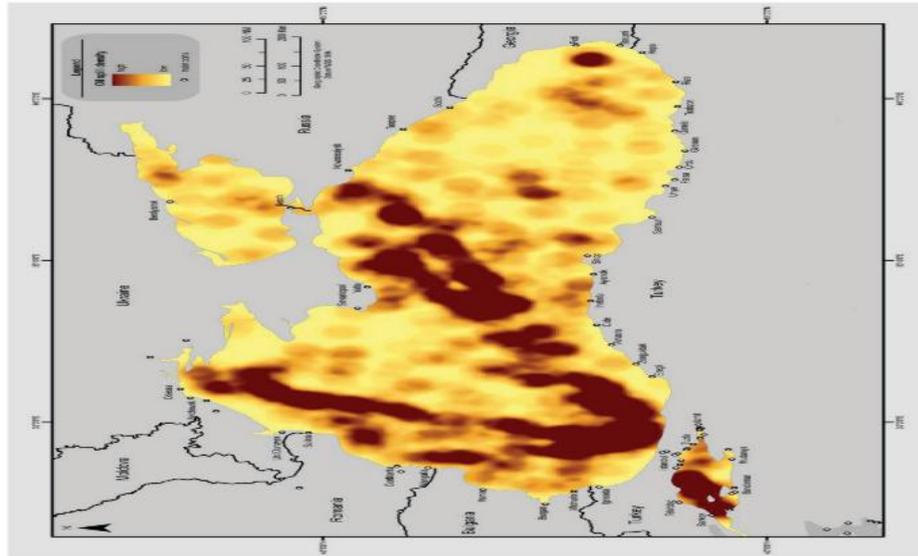
(‰) [24].

–
– <0,015 4,90 / .

(. 4.6) [10].

()

111 [5].



. 4.6 –

2000–2004 . [9].

[1].

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1.

60-

60-

1955 -1966

2.

184

() (*Eugraulis encrasicolus*),

(*Sprattus sprattus phalericus* L.),

(*Trachurus mediterraneus ponticus* Aleev),

(*Scomber scombrus*),

().

—

Mugiliformes

95,3

2

23 %

(*Phyllophora*)

(*Cystoseireta*).

1518

—

750

120

20

(*Tintinnoinea*),

(*Sagittasetosa*),

(*Pleurobracliiapileus*)

(*Oikopleuradioica*),

(*Aureliaaurita*, *Rhizosiomapulmo*).

3.

1

4.

1.
25 (159) / 2017.
« . . . ».- .98–100.
2. , 1982.- .
192.
3.
: - //
. - 41.- .: . .- 2015.- .176.
4.
: , //
. - 21.- .: . .- 2011.- .137–149.
5. : « . . . » , 2006. .
224.
6.
., 1963.- .740.
7.
(, ,).
-2010.- .46 4.- .16–24.
8.
. - , 2011.- .212.
9.
/ .- .: . , 2011.- .480.

10. // . 2016. 5. . 64 – 69.
11. « » IV. . 1. , 1992. – . 432.
12. « » V. . 2. , 1992. – . 220.
13. « »... . IV. . 2, 1992; 1994; , , 2006.
14. « »... . IV. . 2, 1992; , , 2006; , 2011.
15. – . 90(06), 2013. – . 72-90.
16. – // : – . – 2011. – 1. – . 67-78.
17. . , , 42/4/2000. . 12–14
18. . . , . — ∴ , 1982. – . 217.
19. (). . – 2018. – . 74-79.
20. . . – « .», 1983. – . 387.
21. . . – : – , 1995. – . 64.
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23. . . . , –
«
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24. . – : <https://geographyofrussia.com/morya-rossii-chernoe-more/> (15.05.2019).
25. MRAG Ltd
SouthStreamTransport B.V. 14.1
« » . – 2014. –
108 : https://www.south-stream-transport.com/media/documents/pdf/ru/2014/07/ssstbv_ru_esia_a141_web_ru_ru_20140707.pdf. (15.04.2019).
26. :
: http://hmc.meteorf.ru/sea/black/sst/sst_black.html (: 03.02.2019)
27. : <http://blacksea-education.ru/v3.htm> (05.05.2019).
28. : – .
2012, «
».
: <http://oceanography.ru/index.php/component/jdownloads/finish/11/209> (: 15.01.2019).