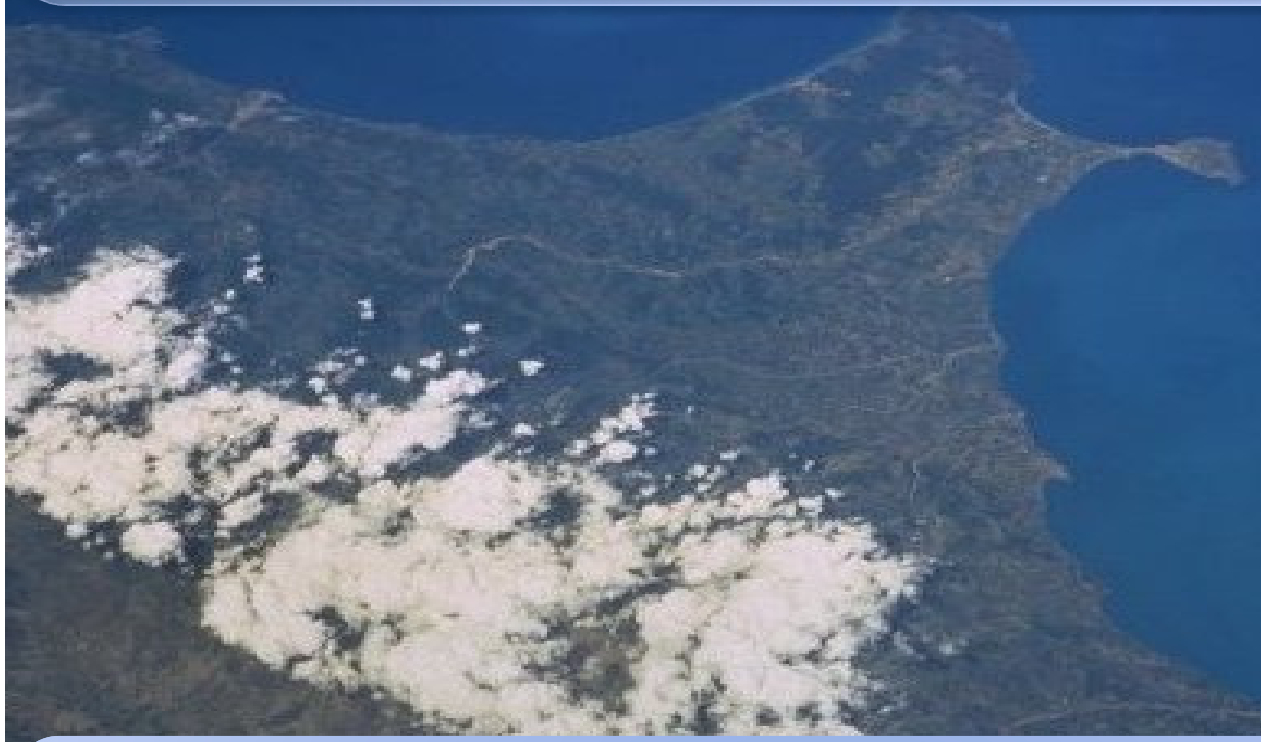
International Conference on
Aquaculture & Fisheries
July 20-22, 2015 Brisbane, Australia

SUSTAINABLE FISHERIES OF THE EUROPEAN ANCHOVY (*Engraulis encrasicolus*) IN THE BLACK SEA, TURKEY







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WHERE IS THE FACULTY OF AQUACULTURE AND FISHERIES?



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WHAT ARE THE FACULTY APPLICATION POSSIBILITIES?

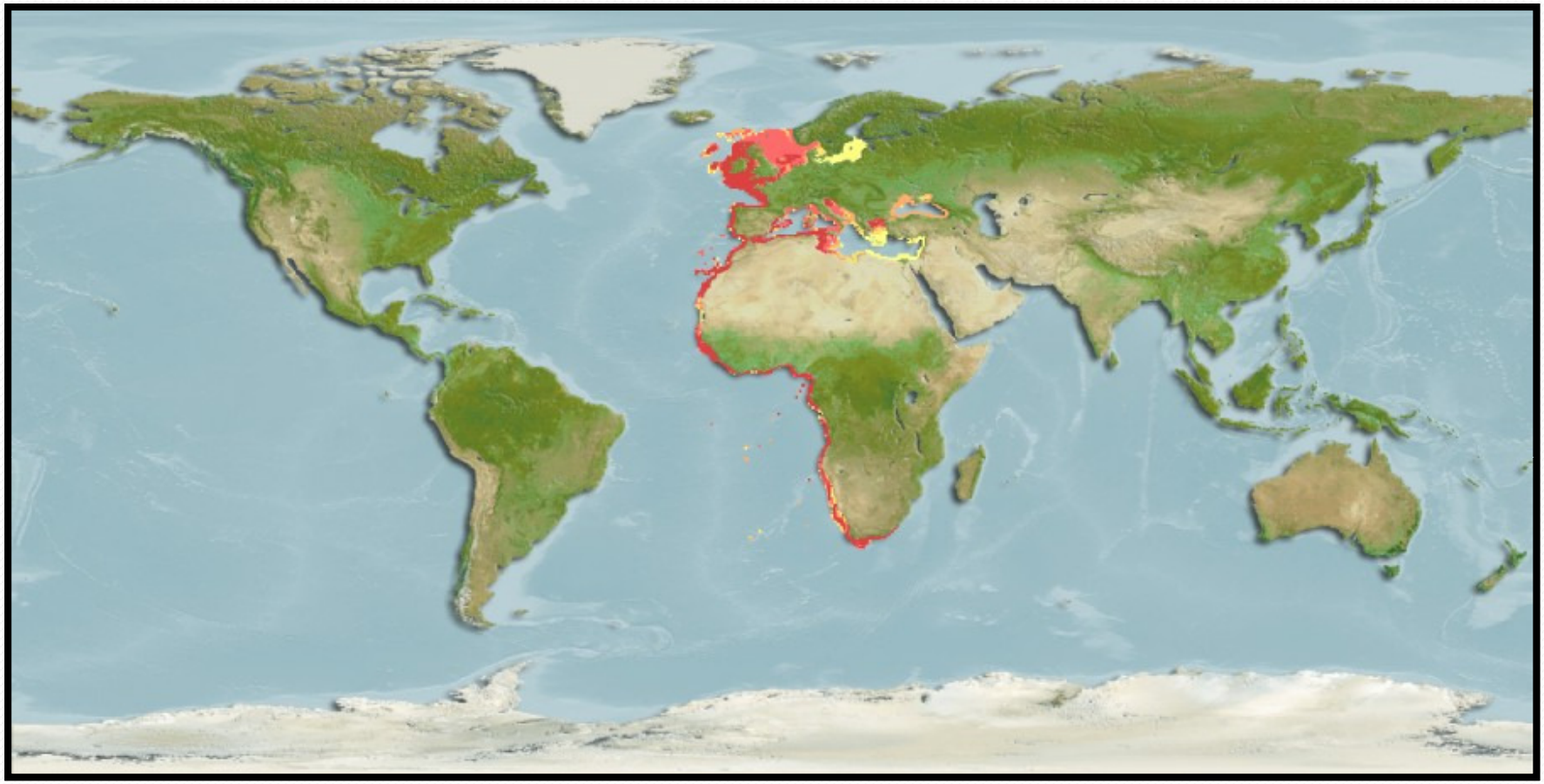
Seydi Ali Reis Research Vessel




TRABZON2011
11TH EUROPEAN YOUTH OLYMPIC FESTIVAL
AVRUPA GENÇLIK OYUNLARI
EYOF 2011



Drainage in the Black Sea Area

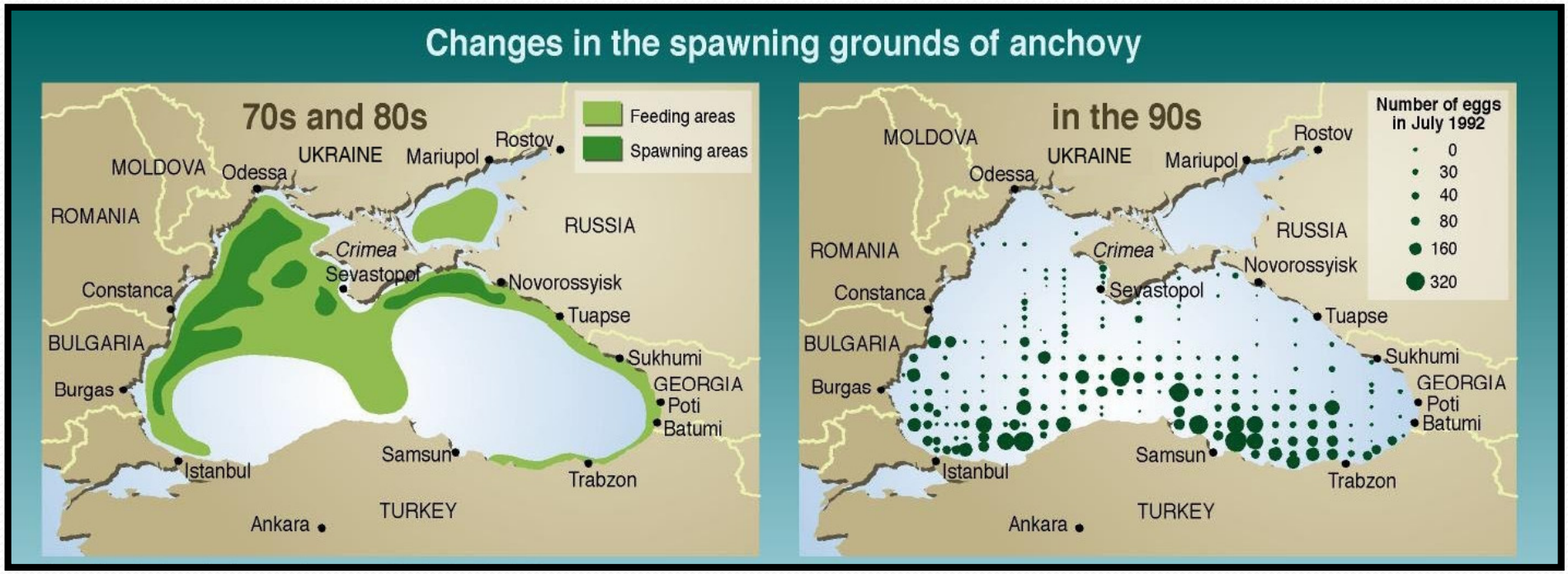


European Anchovy (*Engraulis encrasicolus*) distribution areas

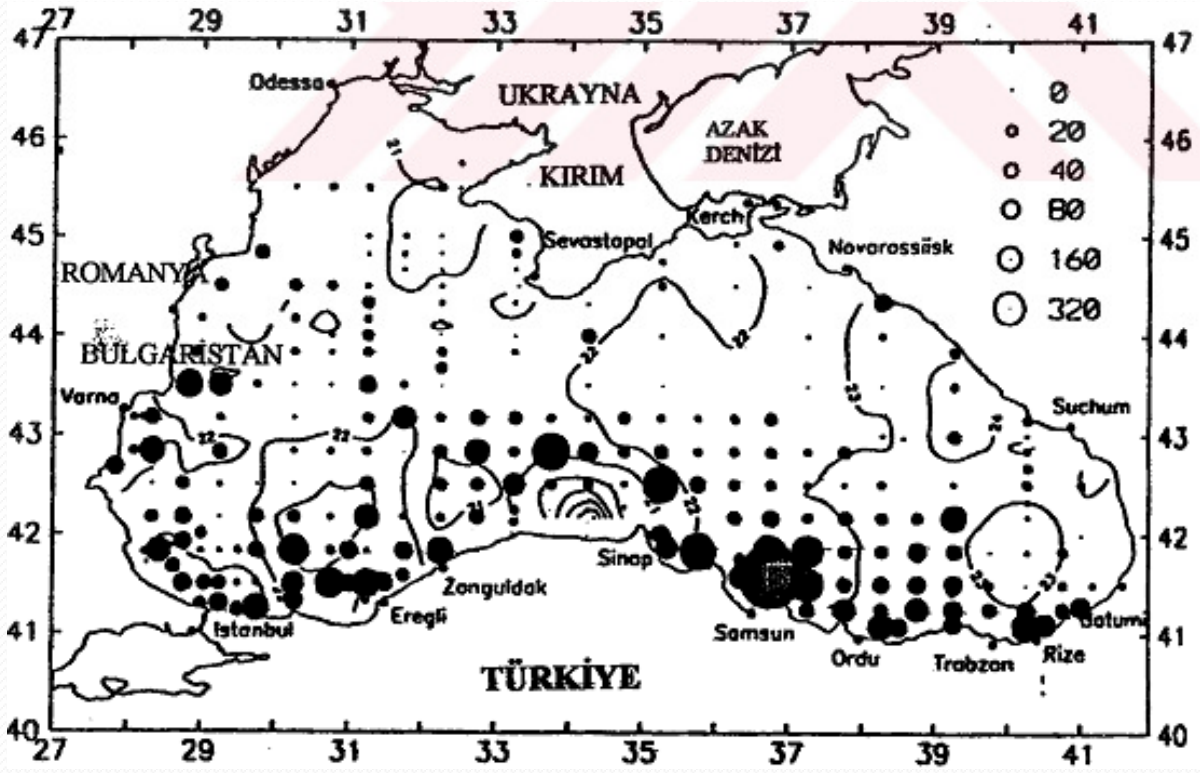
General migration



Ivanov and Beverton, 1985


Changes in the spawning grounds of anchovy
70s and 80s
Feeding areas
Spawning areas
MOLDOVA
Odessa
UKRAINE
Mariupol
Rostov
ROMANIA
RUSSIA
Crimea
Sevastopol
Novorossyisk
Constanca
Tuapse
BULGARIA
Sukhumi
GEORGIA
Burgas
Poti
Batumi
Samsun
Istanbul
Trabzon
TURKEY
Ankara
in the 90s
Number of eggs in July 1992
0
30
40
80
160
320
MOLDOVA
Odessa
UKRAINE
Mariupol
Rostov
ROMANIA
RUSSIA
Crimea
Novorossyisk
Constanca
Sevastopol
Tuapse
BULGARIA
Sukhumi
GEORGIA
Burgas
Poti
Batumi
Samsun
Istanbul
Trabzon
TURKEY
Ankara

Changes of spawning area



Nierman, 1994

The Black Sea currents create a migration of pelagic fishes for biological nutrition, spawning and wintering cover. Hence, in particular, such as anchovies, an important fishing of pelagic fish is discussed in this article on the issues that need to be done. In this sense, common policies are required in Black Sea.



Anchovies production has significantly decreased in recent years due to many factors.

In Black Sea region there have been many surveys. In the context of international projects, long-term monitoring conducted a lot of research is currently being conducted by researchers from different countries in this research. Several of these studies are shown below.



Map of the Black Sea basin - Pollution in the Black Sea Area - Main crude and dirty product routes in the Black Sea - Species richness in countries of the Black Sea region - Black Sea pipelines Socio-economic indicators for the countries of the Black Sea basin - Evolution of the phytoplankton composition in the Black Sea - Black Sea water indicators - Oil transport in the Black Sea - Long term variations in the biomass percentage of copepods in Sevastopol Bay - Turbot distribution in the Black Sea - Water Discharges measured by Biological Oxygen Demand - Fish catch in the Black Sea over the last 30 years, Turkey and USSR.

Total fertilizer consumption in the countries bordering the Black Sea in the 1990`s - Changes in the spawning grounds of anchovy - Phytoplankton pigments concentration in the Black Sea - Long- term changes in the CHl-a levels in the Black Sea - Reduction of the Zernov`s Phyllophora fields in the Bay of Odessa - Endangered species in the Black Sea

Populatıon growth projections in the Black Sea region until 2030 - Nutrients in the Varna Bay and the Romanian Black Sea costal area - Fish catch in the Black Sea over the last 30 years - Fisheries under threat in the Black Sea - Salinity of the Black Sea - Relationship between the decrease in Turkish anchovy catch and the growth of *Mnemiopsis*, 1968-1990 - Comparison of long-term variability of different characteristics of the Black Sea ecosystem - Fish catch in the Black Sea over the last 30 years, Bulgaria and Romania - Expansion of hypoxia and anoxia zones in the northwest of the Black Sea - Fish catch in the Black Sea over the last 30 years - Fish landings and fishing fleet in the Black Sea, 1975-1995 (Report on the Black Sea drainage basin, for the UNEP Global Impact on Waters Assessment -GIWA Black Sea team and the GIWA secretariat, 10 Mar 2006 - by Philippe Rekacewicz, UNEP/GRID-Arendal-

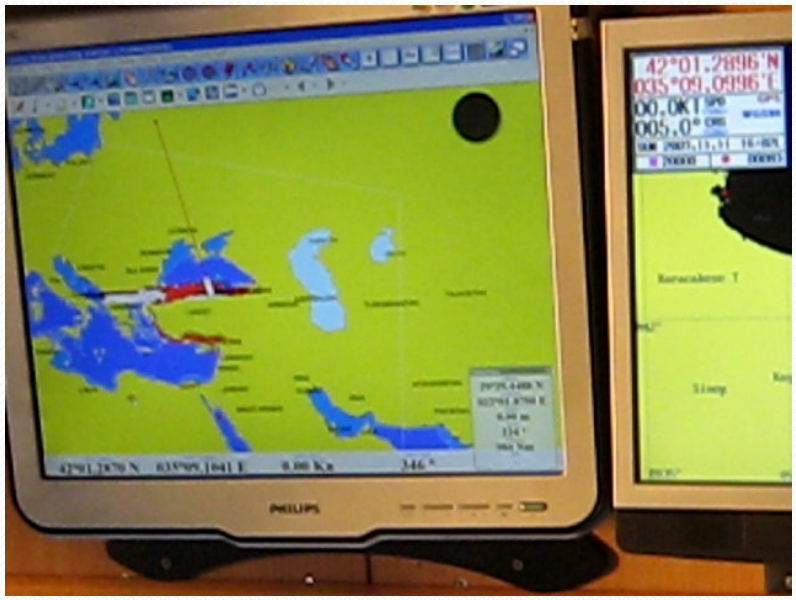
http://www.grida.no/graphicslib/collection/giwa-black-sea-raphics?p=1).

By many researchers in Turkey on the Black Sea, anchovy fisheries biology and population dynamics of several years of research done on various parameters laid down over the years, and the stock of anchovy is known (mean L and W, % age frequancy, % sex ratio, length-weight a-b, Von Bertalanfy parameters, S,Z,F,M and E).

[Ozdamar *et al*., 1991; Karacam and Duzgunes, 1988; Duzgunes and Karacam, 1989; Unsal, 1989; Okur, 1989; Genc and Basar, 1991; Genc and Basar, 1992a; Genc and Basar, 1992b; Mutlu, 1994; Ozdamar *et al.,* 1995; Mutlu, 2000; Kayalı, 1998; Mutlu, 2000; Samsun *et al*., 2006; Sahin *et al.,* 2006; Bilgin, 2006; Saglam and Saglam, 2013.}



In the Black Sea, anchovy fishery biology of the basic parameters and the data on the prosecution of continuous research has been made by many authors, in recent years (Aka, Z. Torcu H and Turan C, A, 2004., Özdemir, S and Duyar H, A, 2013., Bat L, and *et al* , 2013, Kalaycı and *et a*l, 2007).

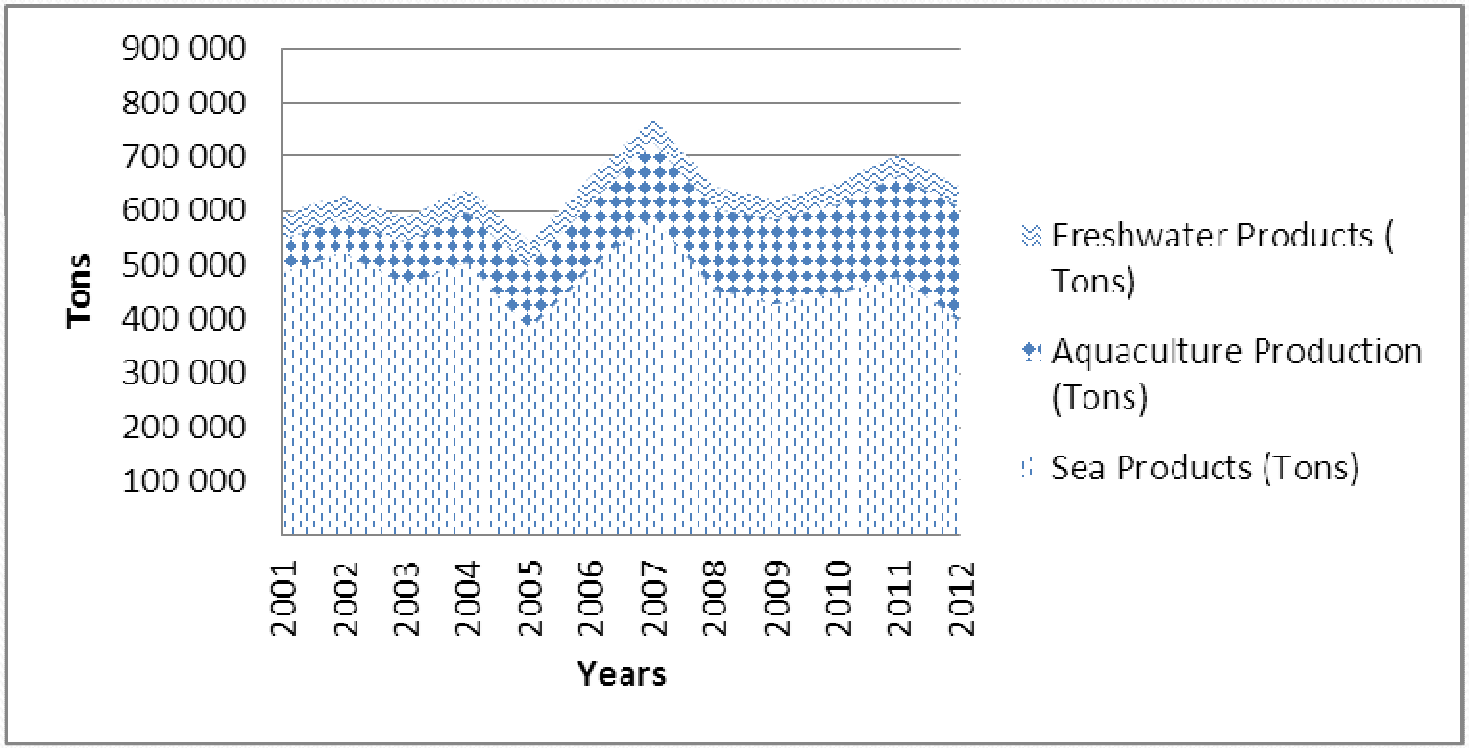


What kind of changes in the general conditions of changing climate, still to be followed by the researchers within the framework of the Black Sea. (Kideys A.E, 1994, Kideys A, E and *et al* , 1999 Gordina, A.D and *et a*l, 1997, Oguz T and Gilbertb D, 2007, Bat L. and *et a*l, 2007, Samsun O and *et al*, 2004., Şahin C and *et a*l, 2009).

Other riparian countries of the Black Sea in the various studies were conducted on fish such as anchovy and horse mackerel (Yankova M and *et a*l, 2010, Alison J. and *et a*l, 2009) are known. Horse mackerel studies are avaible in black sea region but not as much as anchovies. (Kasapoglu N and Düzgüneş, E, 2013, Yankova, M, 2013, Bostancı, D, 2009).

All this work is done by individual researchers observed a variety of very different dates. In general, small pelagic fish such as anchovy and horse mackerel of the Black Sea countries never conducted a lot of researches. Legislation and for the management of fisheries research in our country, a small numbers (Sesli FA and *et a*l, 2009, Can, MF and Smith, A, 2012) are available.

Although in recent years, particularly in the Black Sea anchovies have made up of different topics and much research is still ongoing, but the data below shows that significant decrease have occurred in the amounts of the annual hunting.



Fishery products in Turkey according to years (TÜİK, 2012).





There is not enough prohibition of size of hunting for anchovy in Georgia, where huge amounts of small-sized hunting of anchovies. Georgia, which was founded hunting anchovy for fish meal and processed food factories.

The purpose of this article, the Black Sea, which is the most important fish species in this imported and also exported to the EU countries, the measures necessary for the operation of profitable stocks in the Black Sea coastal countries and international level, as well as to facilitate open discussion and knowledge of the subject concerned, the necessary measures to be retrieved.



In the Black Sea countries and problem of anchovy hunting area in (Batum) Georgia.

In this study, the amount of aquaculture in Turkey in recent years, how hunting equipment and technologies are affected by many parameters that affect the current situation has been analyzed. Anchovies in Turkey, in recent years, on the research carried out in previous years were compared with the results of the new research.

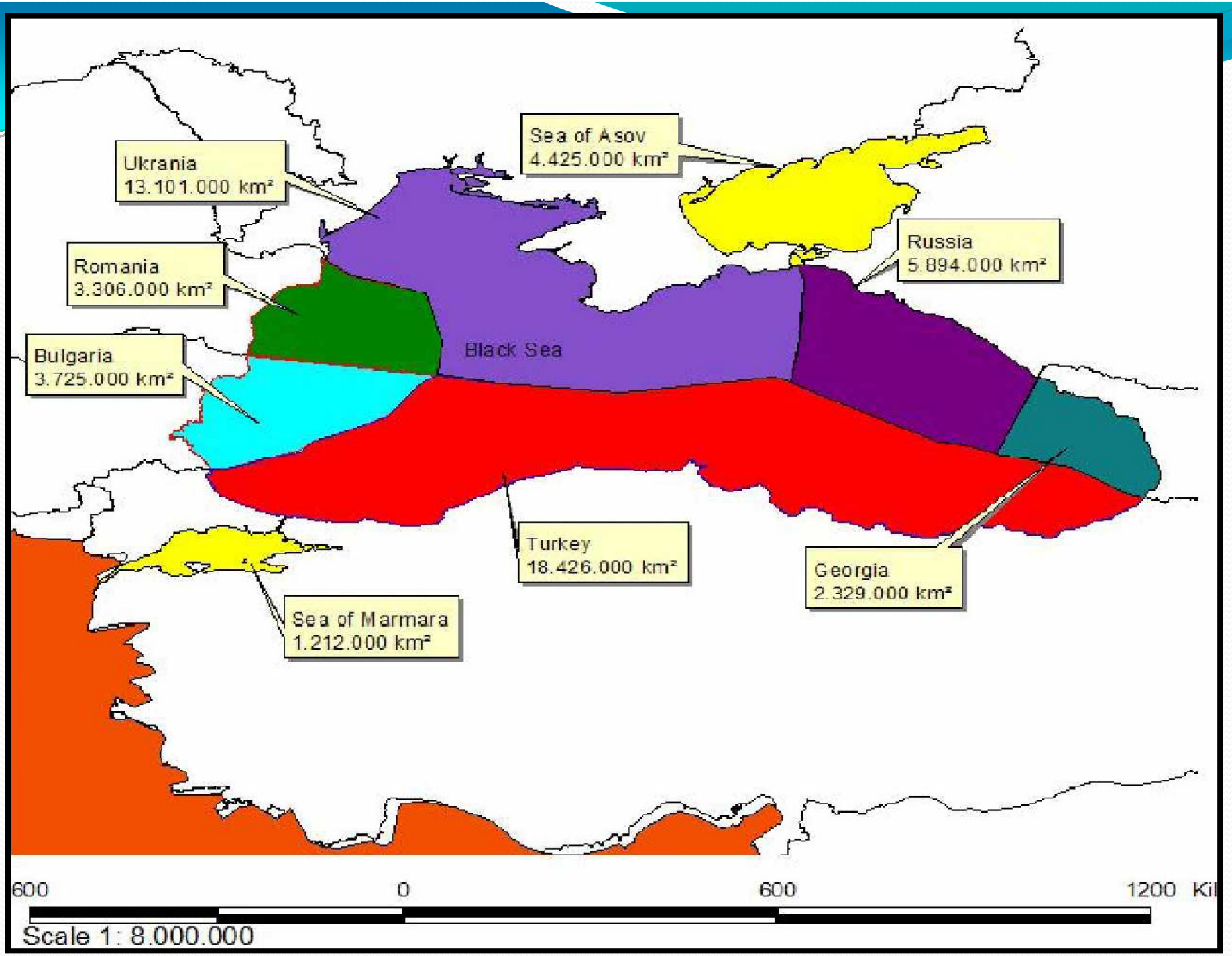
On the subject the old and new practices of Turkey Statistical Institute and the General Directorate of Fisheries and Aquaculture data are used. With all the neighboring countries of the Black Sea region, is still used as a common asset protection and control measures are evaluated by Turkey. Exclusive economic zones (km^2), properties of protection and control organizations, coastal lengths (km), total fish production (t), the amount of fish caught in the Black Sea (t) and number of fishing vessels are compared for the countries of Black Sea region.

Anchovy, the most important pelagic species caught in the Black Sea and Turkey as a dominant; at least half of the annual aquaculture production is around 600,000 tons. At the same time a larger fish and mammals in the food chain is also an important source of nutrition.

In recent years, especially the 2011-2012 hunting season is one of the important fishing centers on the Black Sea province of Sinop anchovy fishing only 12 days, and then quickly drain is very thought-provoking and need to focus on the shores of Georgian issue. This topic has been on anchovy in the old and new in comparison with the results of the research were injured, anchovy fishery management carefully maintained.



Purse seine in the Black Sea.


Sea of Asov
4.425.000 km²
Ukrania
13.101.000 km²
Russia
5.894.000 km²
Romania
3.306.000 km²
Black Sea
Bulgaria
3.725.000 km²
Turkey
18.426.000 km²
Georgia
2.329.000 km²
Sea of Marmara
1.212.000 km²
600
0
600
1200 Kil
Scale 1: 8.000.000

Turkey has the highest economic zone value within the 6 Black Sea region counties, Table 1.

The Black Sea countries economic zones (Anonym, 2013 a), http://www.seaaroundus.org/eez/

Data	Bulgaria	Georgia	Romania	Russia	Turkey	Ukraine
Exclusive economic zone (km2)	35156	22765	20598	66854	172199	144038

Turkey has the greatest share in the context of the amount of fisheries production, coastal lengths, catch size and fishing powers within the Black Sea countries.

The amount of fisheries production, coastal lengths, catch size and fishing powers of the Black Sea countries (Duzgunes, E., Erdogan, N. 2008).

Data	Bulgaria	Georgia	Romania	Russia	Turkey	Ukraine
Coastal length (km)	354	310	225	800*	1329	2782*
Total fish production (t)	11000	3000	13000	3051000^	644000	229000
The amount of fish caught in the Black Sea (t)	2843	2837	1824	24922	342455	63161
The Black Sea Anchovy (Engraulis encrasicolus ponticus) minimum of catch size (cm)	unknown	7	unknown	unknown	9	unknown
Number of Fishing vessels	1261	360	436	2912	7308	2300

* Including Azov Sea.

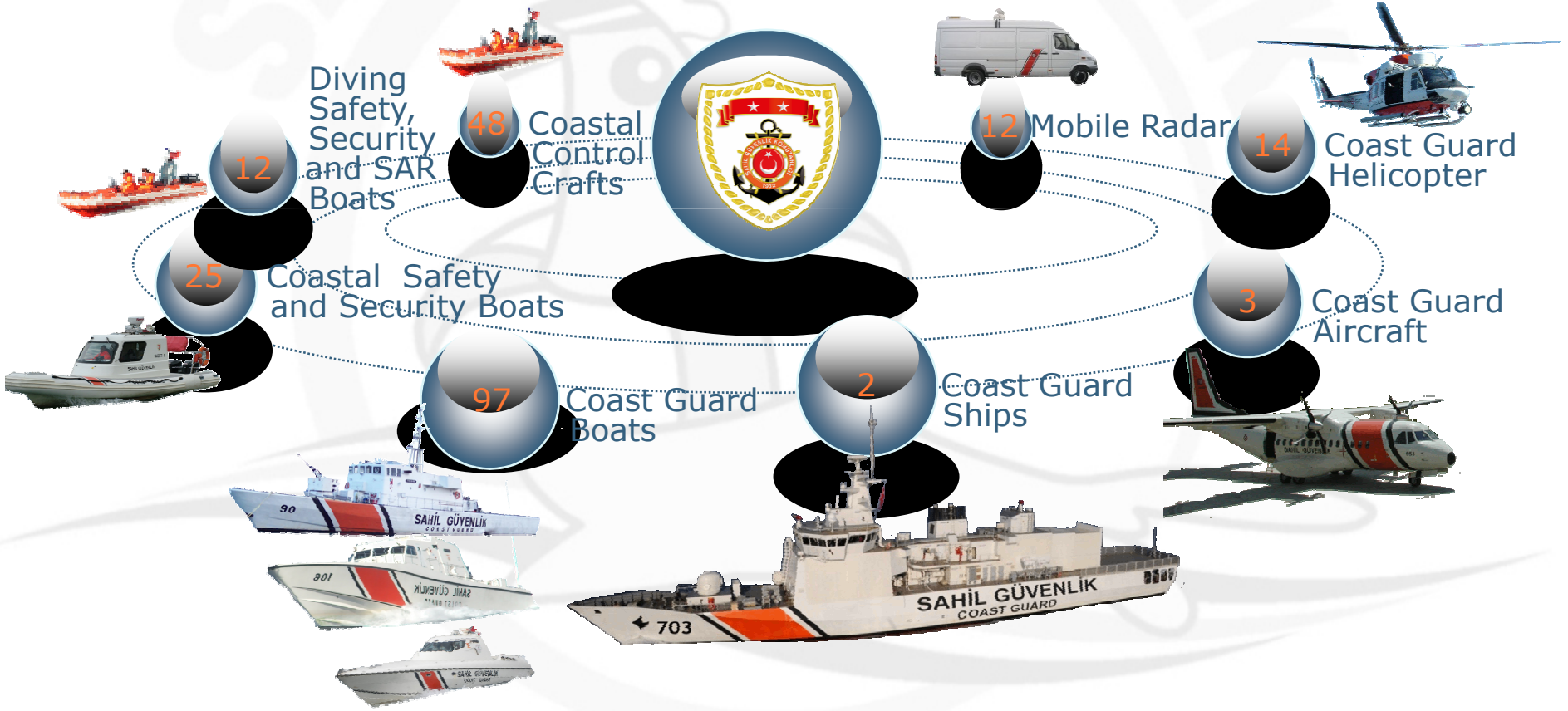
^ Including high seas fisheries

The total coast guard elements of the Black Sea countries (T.C. SGK 2013)

Data	Bulgaria	Georgia	Romania	Russia	Turkey	Ukraine
Ship	25	22	35	250	184	44
Aircraft	-	-	-	Number is unknown	3	-
Helicopter	-	-	-	Number is unknown	14	-

ish Coast Guard Assets

2013

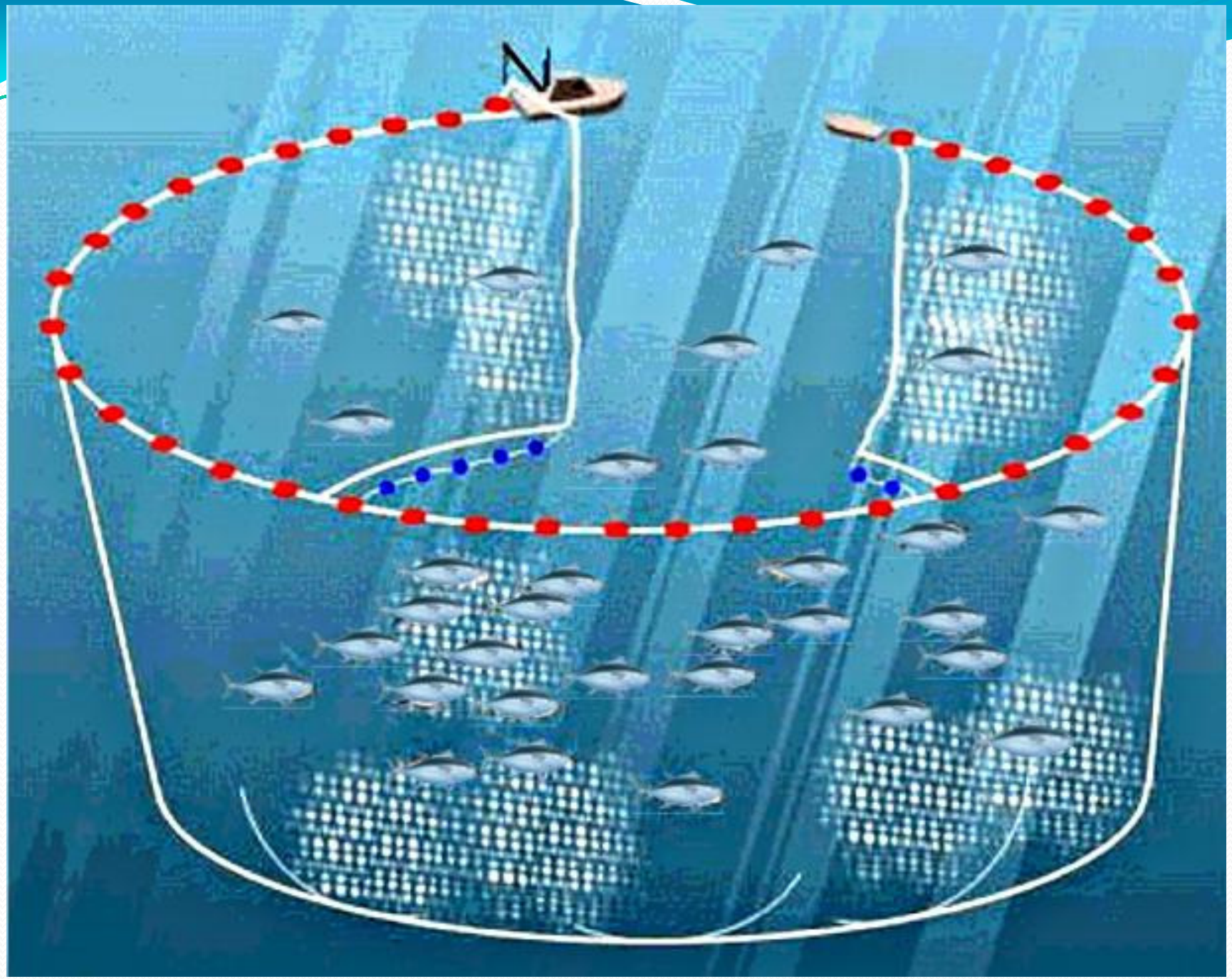




Turkey, especially anchovy, horse mackerel, bonito used for catching fish such as purse seiners fishing capacity has reached quite large. Length of these boats, motor power, and very sophisticated fish finding equipment, etc., is more advanced than all the other countries in the Black Sea.

The amount of anchovy fishing for Turkey, an important place in the fisheries sector. Including fish flour and oil mills, particularly, provides a small retail fishermen living by selling fish, as much as 20 to 60 meters long the owners of many elements of the purse seiners fishing anchovy, fishing sector and the amount of time adversely affected by the reduction.




N

Gırgır Teknesi




JRC
iveco aifo

Modern Power Block ve Kullanılışı




Balığın Güverteye Dökülmesi



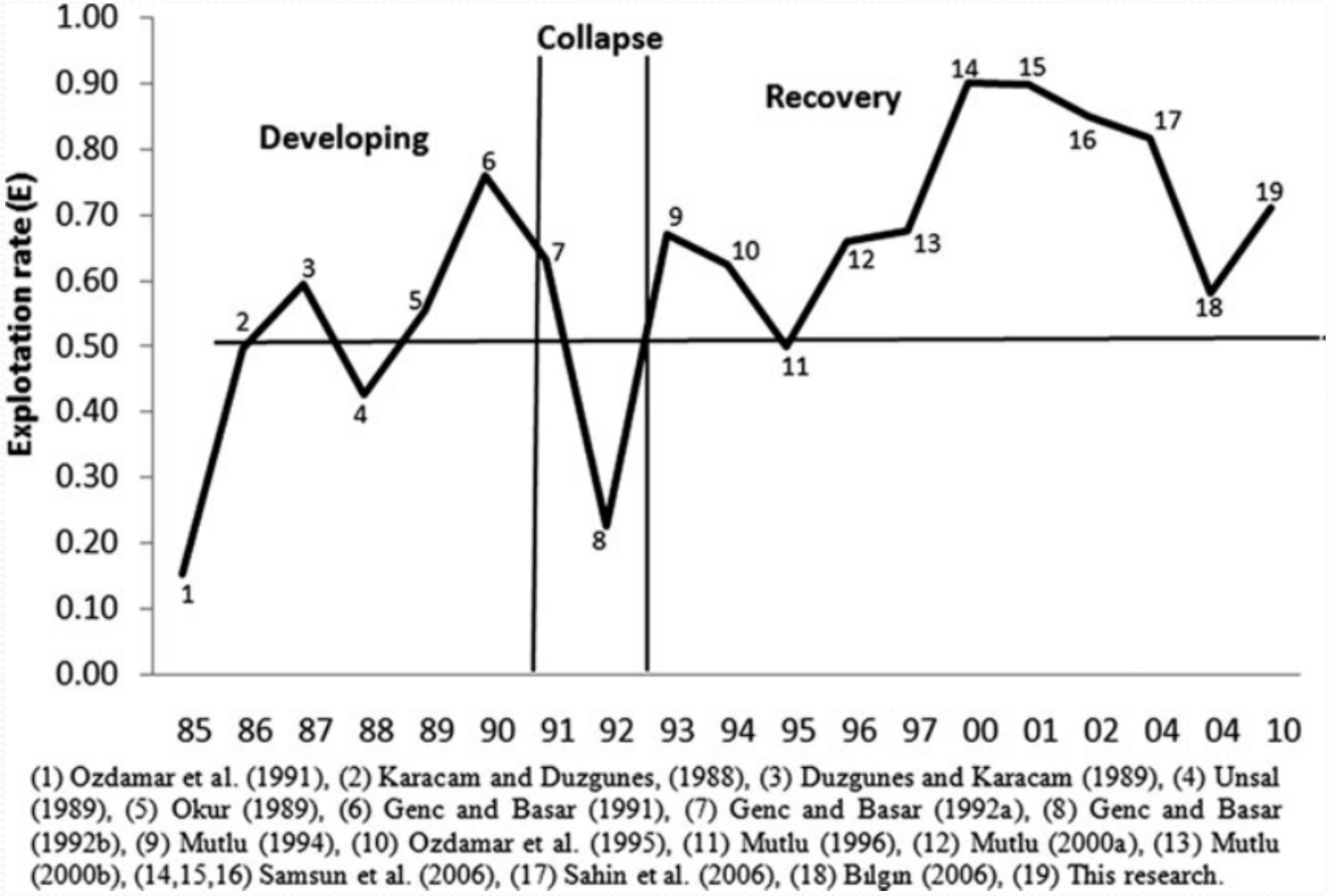
Anchovy is going to fish oil fabric.

Especially in Turkey, the Coast Guard is renewed every year and with increasing knowledge of the hardware and the control of fishery products as fishing is a very important. During these audits, the fishermen are also subject to various training programs in certain periods.





Hunting pressure in recent years, clearly demonstrating the Black Sea comparative annual exploitation rate were analyzed (excessive hunting pressure seems to be still on anchovies.



(1) Ozdamar et al. (1991), (2) Karacam and Duzgunes, (1988), (3) Duzgunes and Karacam (1989), (4) Unsal (1989), (5) Okur (1989), (6) Genc and Basar (1991), (7) Genc and Basar (1992a), (8) Genc and Basar (1992b), (9) Mutlu (1994), (10) Ozdamar et al. (1995), (11) Mutlu (1996), (12) Mutlu (2000a), (13) Mutlu (2000b), (14,15,16) Samsun et al. (2006), (17) Sahin et al. (2006), (18) Bılgın (2006), (19) This research.

Exploitation rate of anchovy in the Black Sea recent year

(N. Erdogan Saglam and C. Saglam, 2013)

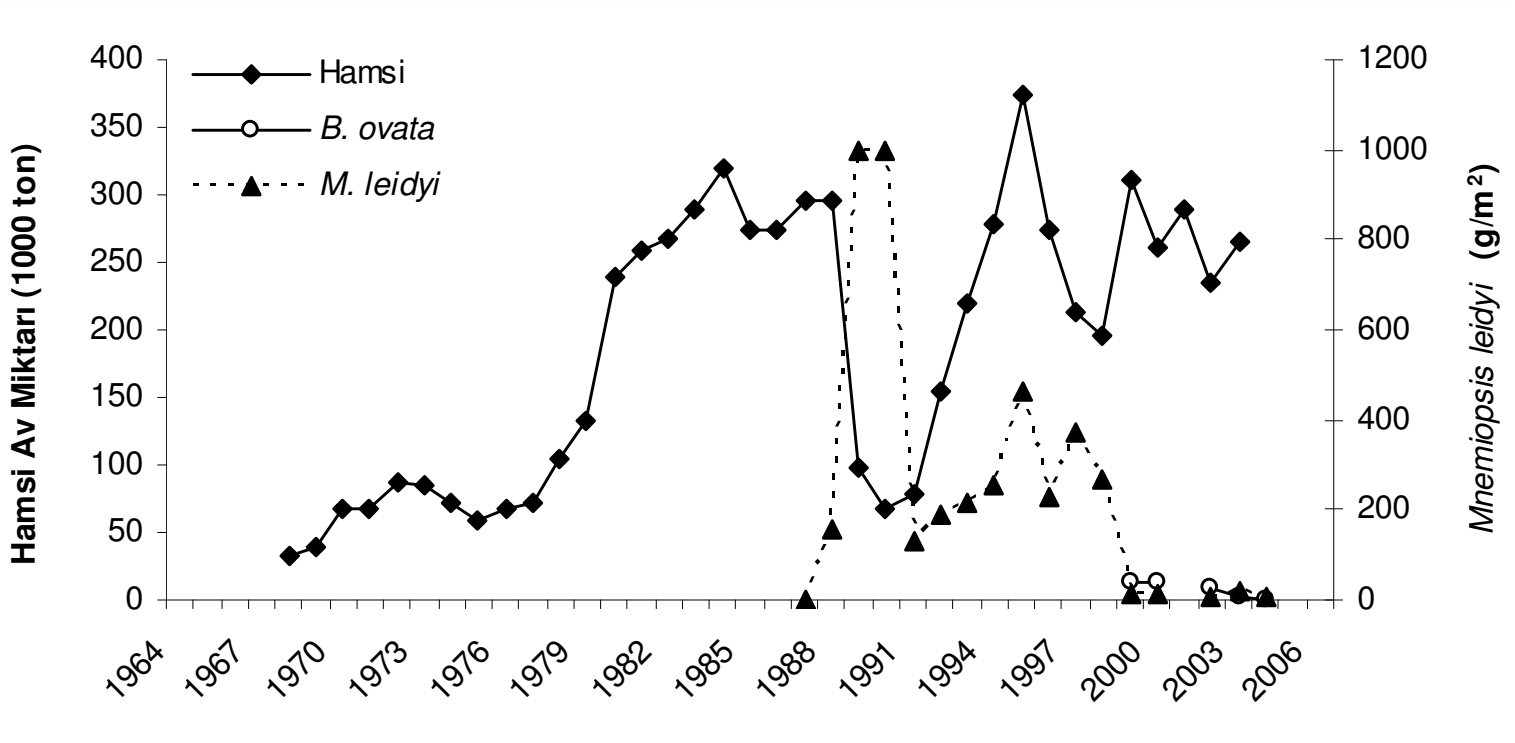
Sezon	***Lmax***	Literatür
1985-1986	16.1	Erkoyuncu ve Özdamar, 1989
1986-1987	***16.9***	Karaçam ve Düzgüneş, 1990
1987-1988		Düzgüneş ve Karaçam, 1989
1987-1988	15.3	Özdamar ve diğ. 1994
1988-1989	15.3	Özdamar ve diğ. 1994
1988-1989	13.0	Ünsal, 1989
1989-1990		Okur, 1990
1990-1991		Genç ve Başar, 1991
1991-1992	13.8	Genç ve Başar, 1992
1992-1993		Genç ve Başar, 1993
1993-1994	14.4	Mutlu, 1994
1994-1995	15.3	Özdamar ve diğ. 1995
1995-1996		Mutlu, 1996
1996-1997	13.5	Kayalı, 1998
1996-1997	15.7	Mutlu, 2000
1997-1998	15.3	Mutlu, 2000
1997-1998	13.8	Gözler ve Çiloğlu, 1998
1998-1999	14.3	Samsun ve diğ. 2004
1999-2000	14.3	Samsun ve diğ. 2004
2000-2001	14.1	Samsun ve diğ., 2006
2001-2002	14.6	Samsun ve diğ., 2006
2002-2003	14.9	Samsun ve diğ., 2006
2004-2005	15.2	Bilgin ve diğ. 2005
2004-2005	15.0	Şahin ve diğ., 2008
2005-2006	15.0	Şahin ve diğ., 2008
2009-2010	15.1	Genç ve diğ., 2010
2010-2011	14.8	Sağlam ve Sağlam, 2013

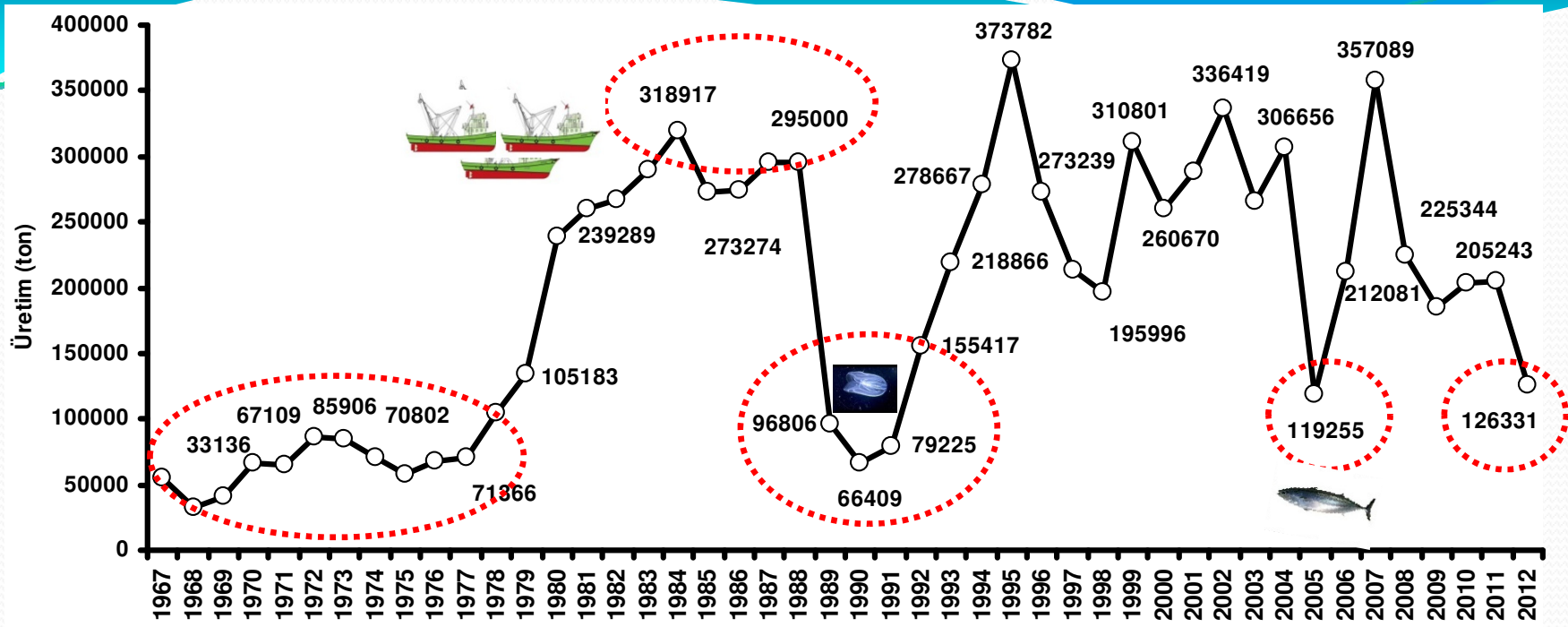
Fast growth and short living species

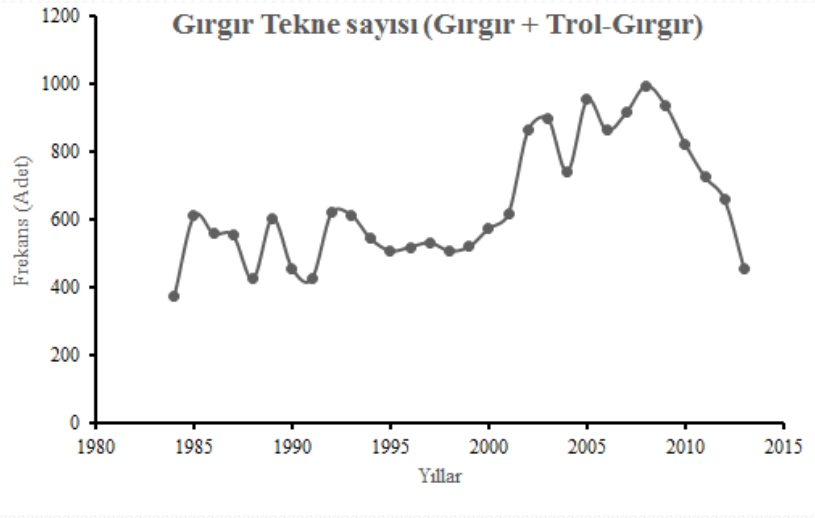
Growth up to 3 ages

Measured Maximum length **16. 9** cm

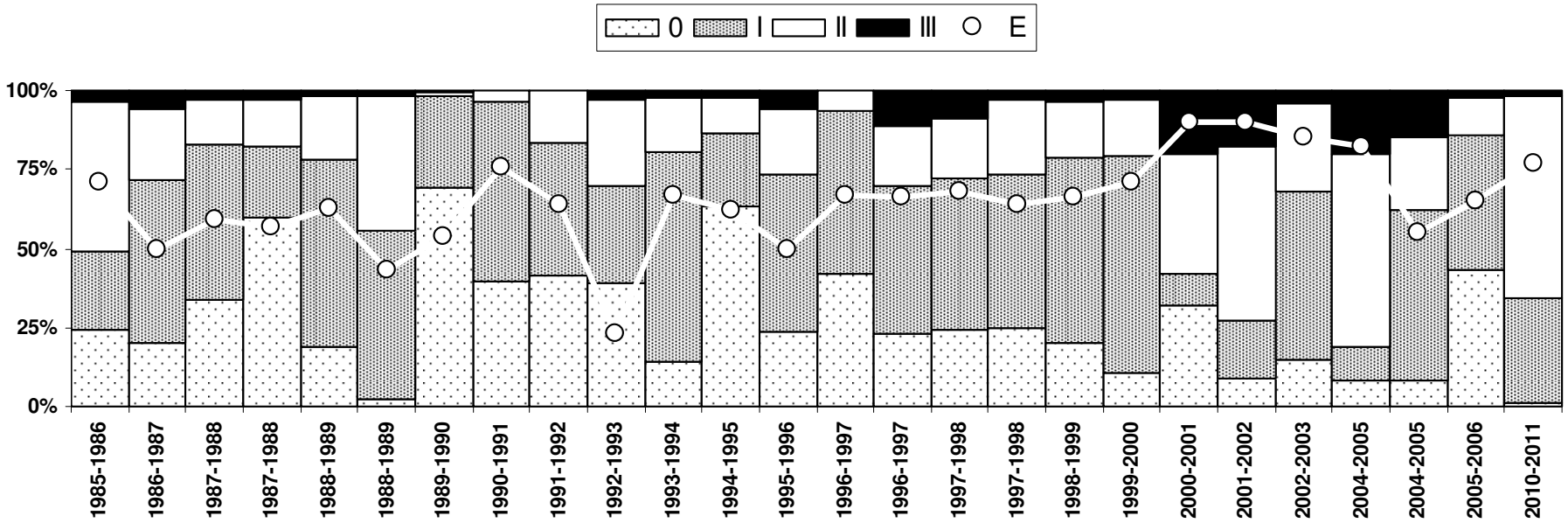
Ctenophore effects



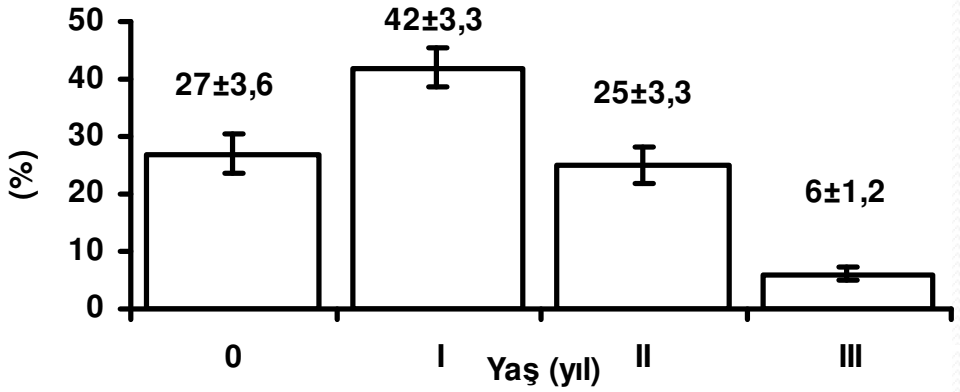

Üretim (ton)
400000
350000
300000
250000
200000
150000
100000
50000
0
1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
33136
67109
85906
70802
71366
105183
239289
318917
273274
295000
96806
66409
79225
155417
218866
278667
373782
273239
195996
310801
260670
336419
306656
119255
357089
212081
225344
205243
126331


Gırgır Tekne sayısı (Gırgır + Trol-Gırgır)
Frekans (Adet)
1200
1000
800
600
400
200
0
1980 1985 1990 1995 2000 2005 2010 2015
Yıllar

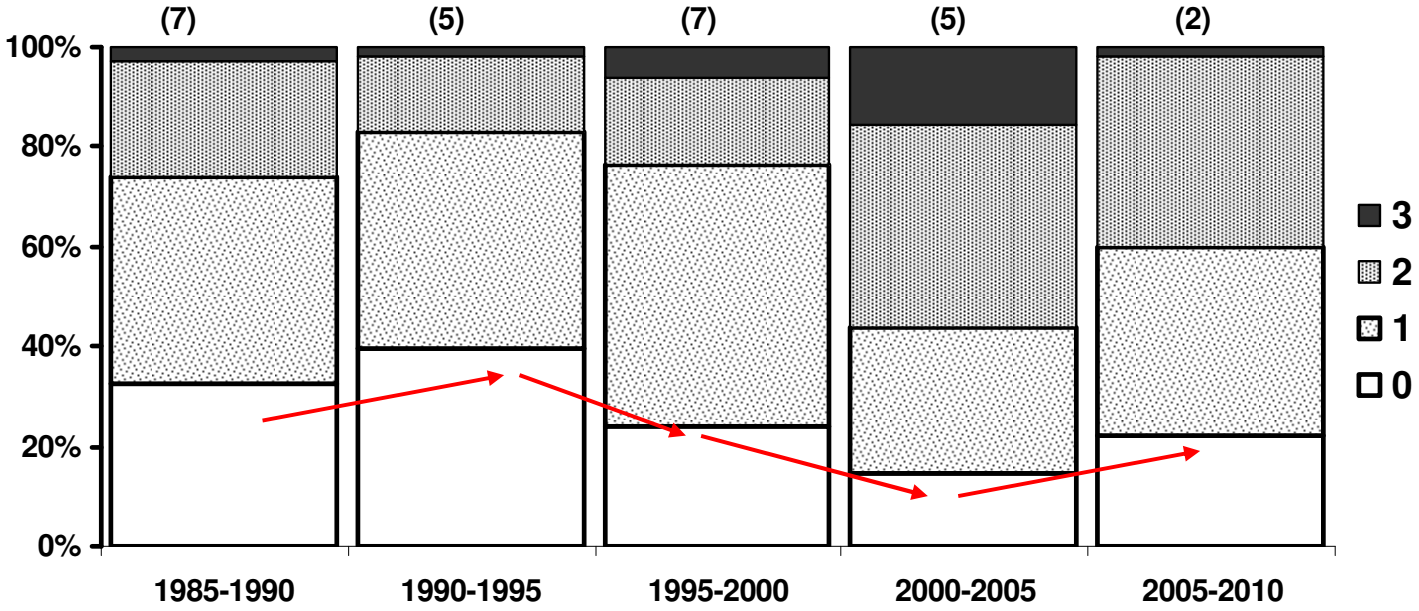
Age composition



From 1985 to 2011



Age composition

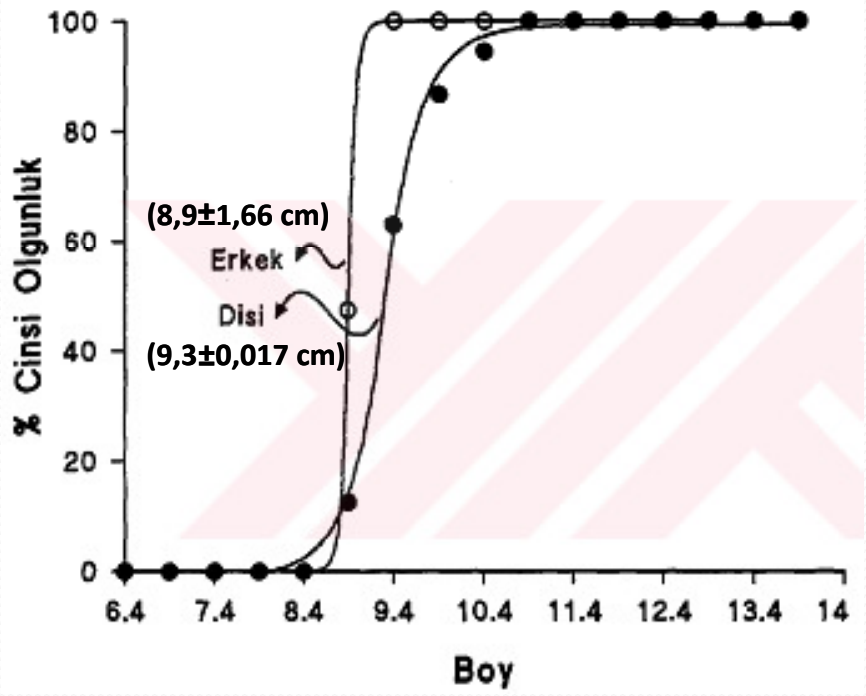


	Age (Year)			
Season	0	1	2	3
1985–1990	33±23,9	41±15,4	23±16,3	3±1,7
1990–1995	40±17,4	44±17,9	15±8,7	2±1,3
1995–2000	24±9,4	53±8,1	17±5,3	6±3,3
2000–2005	15±10,2	29±22,5	41±16,5	15±6,8
2005–2010	22±29,8	38±6,8	38±36,9	2±0,3

Maturity

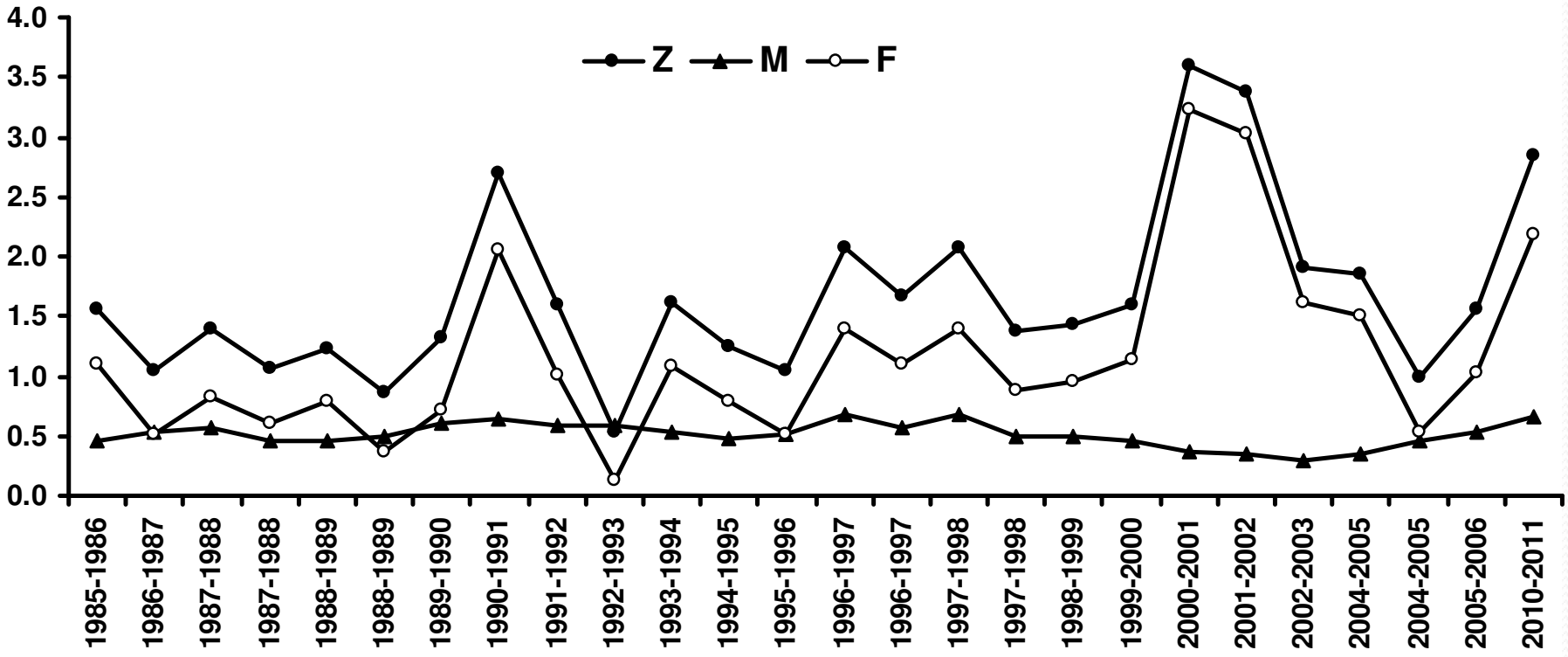
Size at age (1985 - 2011)

	0	I	II	III
Lort.±SH (Min. – Mak.)	8,3±0,09 (7,15 – 8,98)	10,3±0,09 (8,8 – 11,1)	12,1±0,09 (11,2 – 13,1)	13,3±0,09 (12,5 – 14,1)
Number of working	(n = 24)	(n = 24)	(n = 24)	(n = 23)

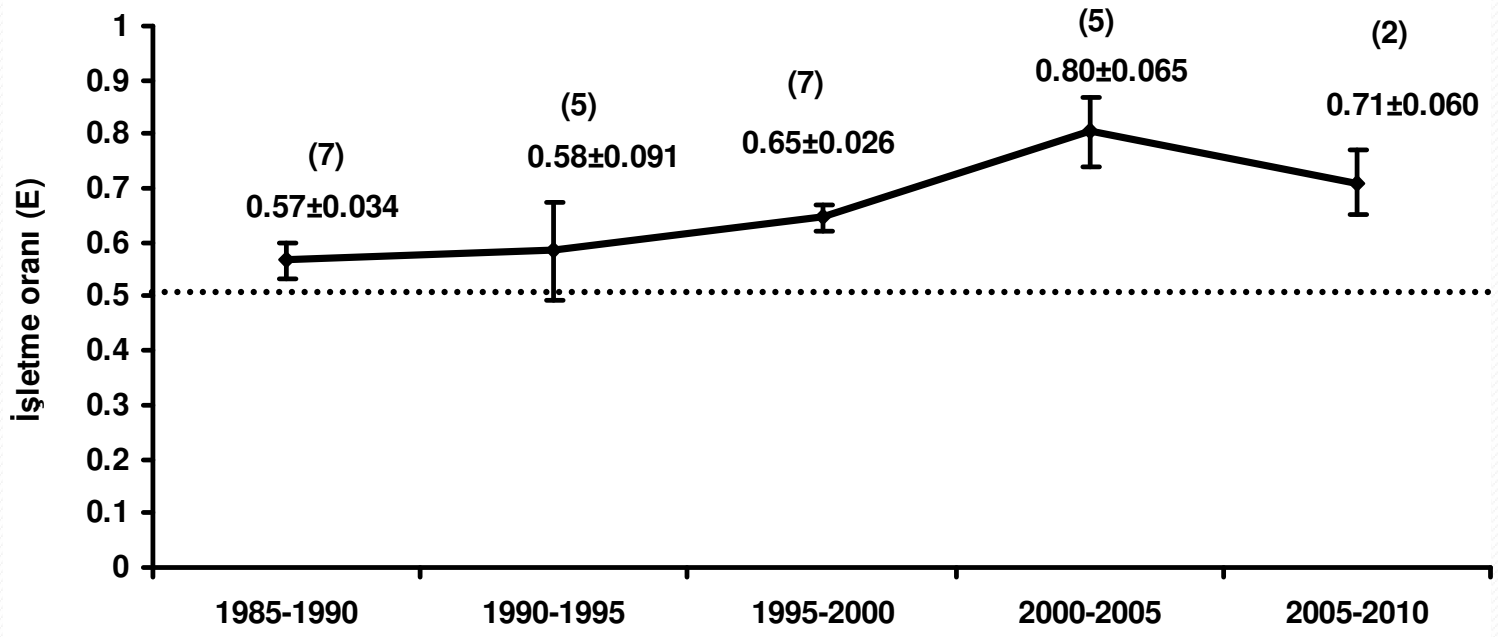


Maturity size of anchovy in the Black Sea (Kayalı, 1998)

Mortality ratio from 1985 to 2011



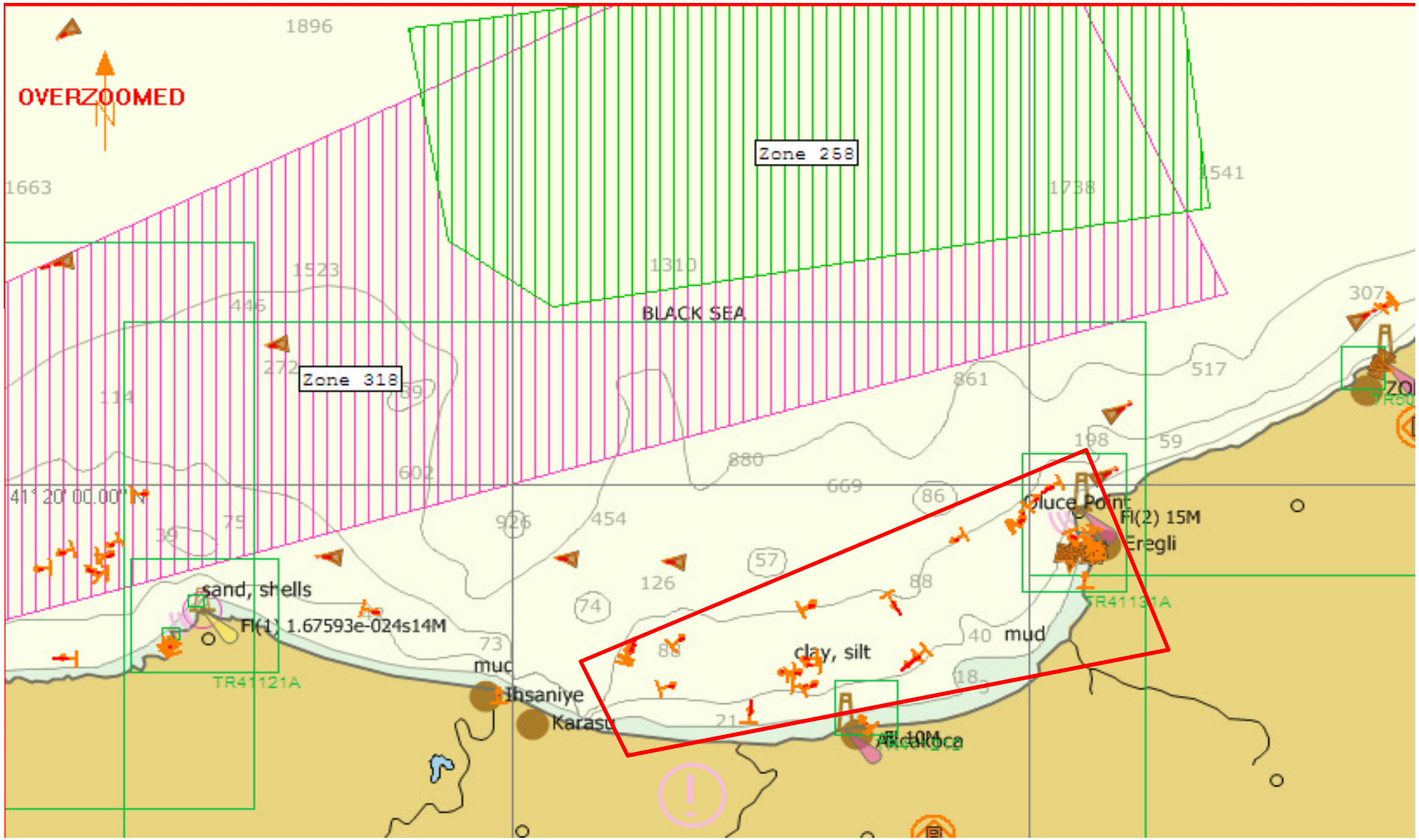
Exploration ratio from 1985 to 2010



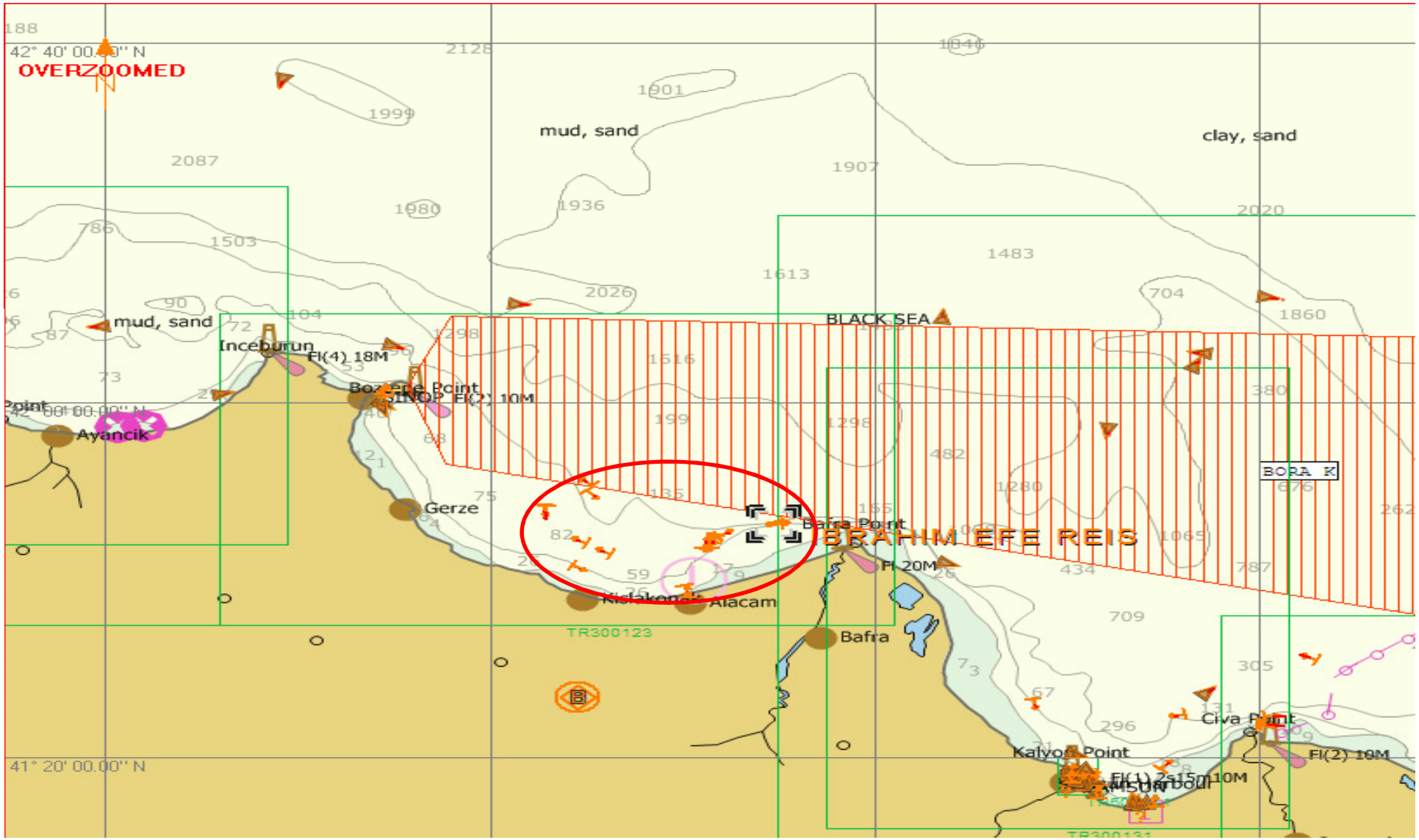
E *mean* ***(1985 - 2010)*** : 0.65±0,029



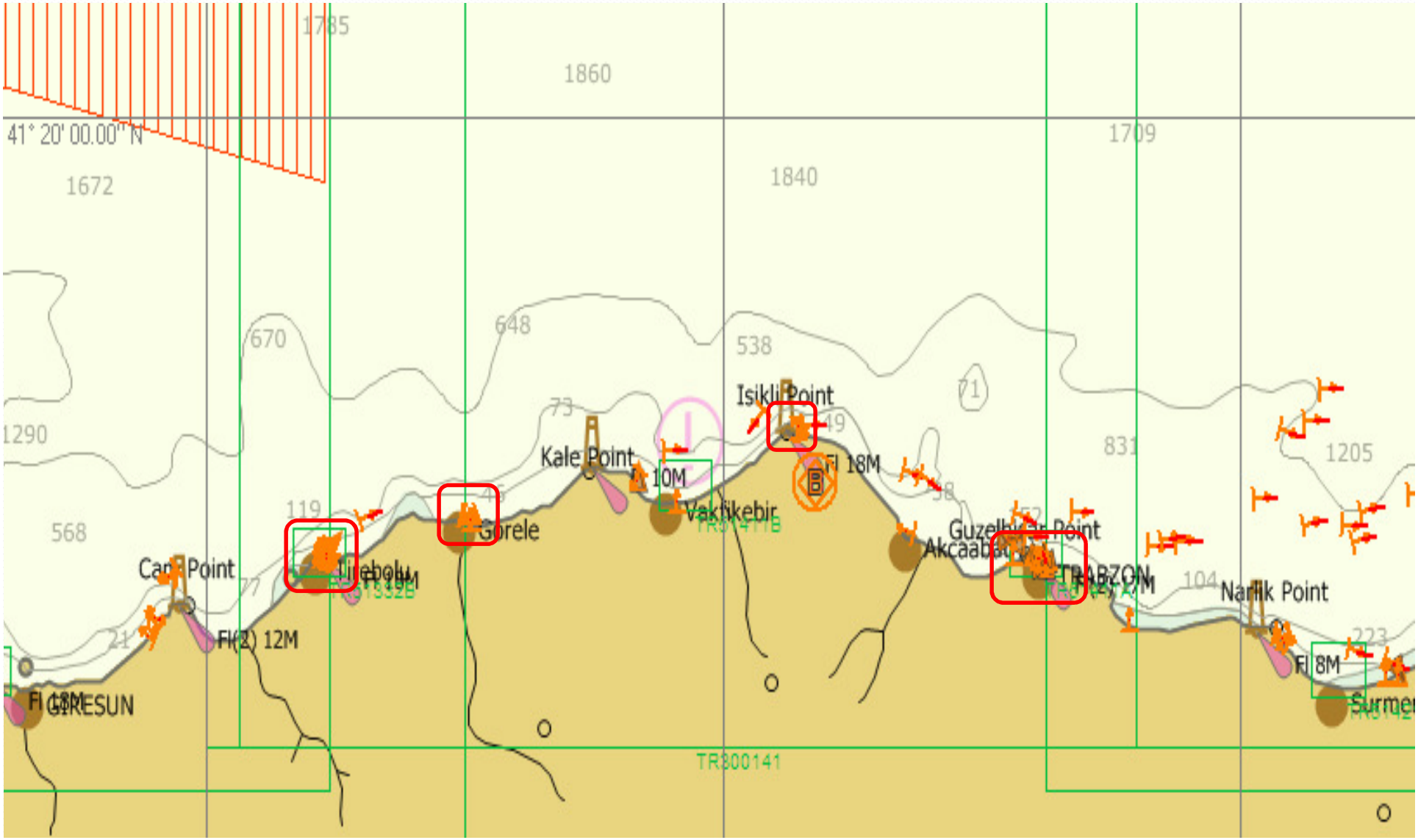
IMMIGRATION OF ANCHOVY ON THE WEST BLACK SEA 2014-2015 FISHING SEASON



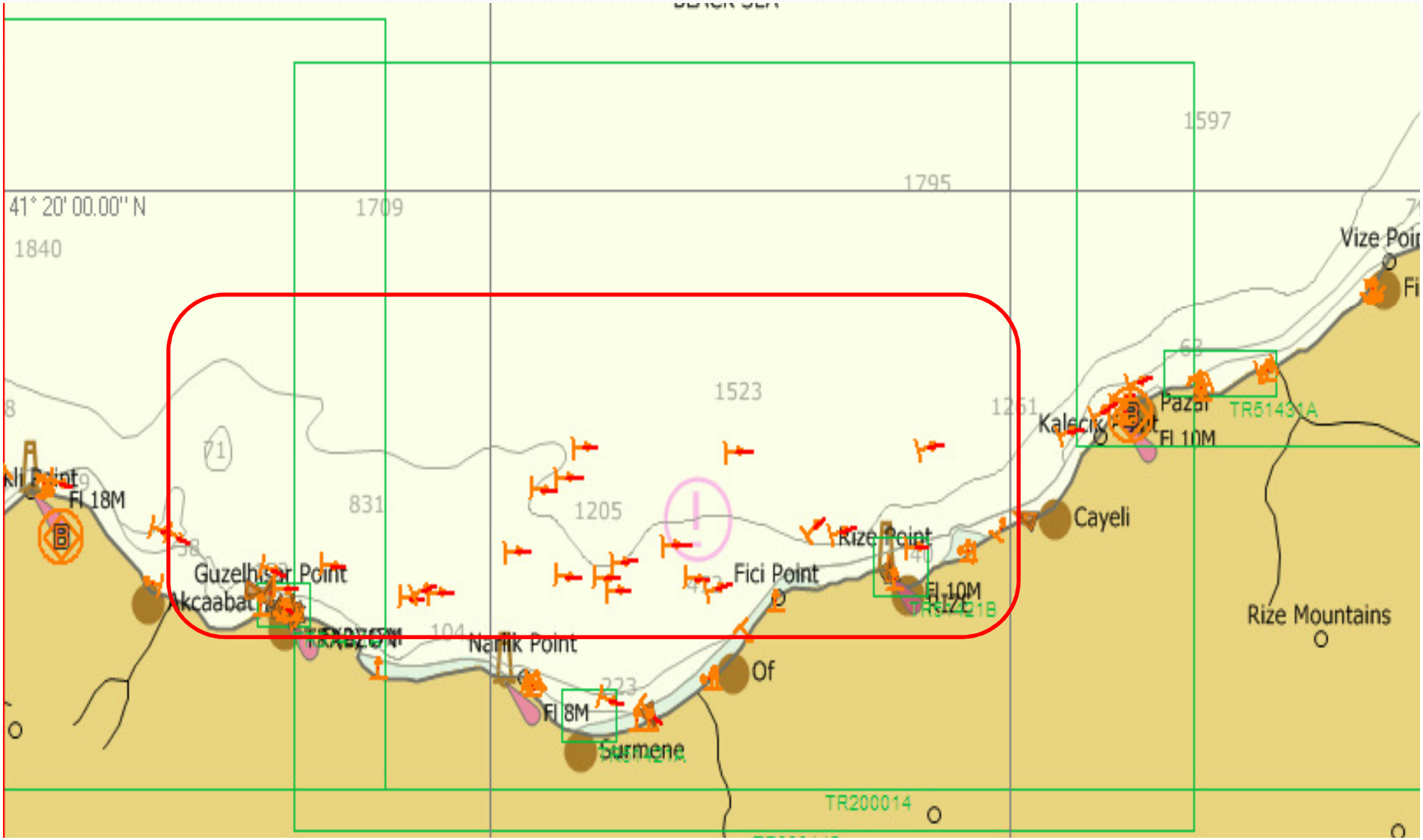
IMMIGRATION OF ANCHOVY ON THE MIDDLE BLACK SEA
2014-2015 FISHING SEASON



IMMIGRATION OF ANCHOVY ON THE EAST BLACK SEA 2014-2015 FISHING SEASON



IMMIGRATION OF ANCHOVY ON THE EAST BLACK SEA 2014-2015 FISHING SEASON

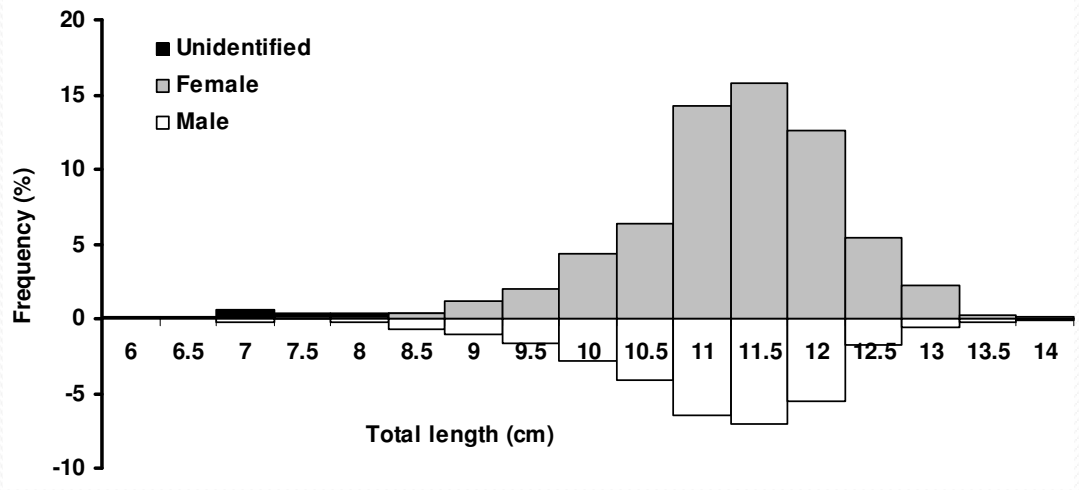




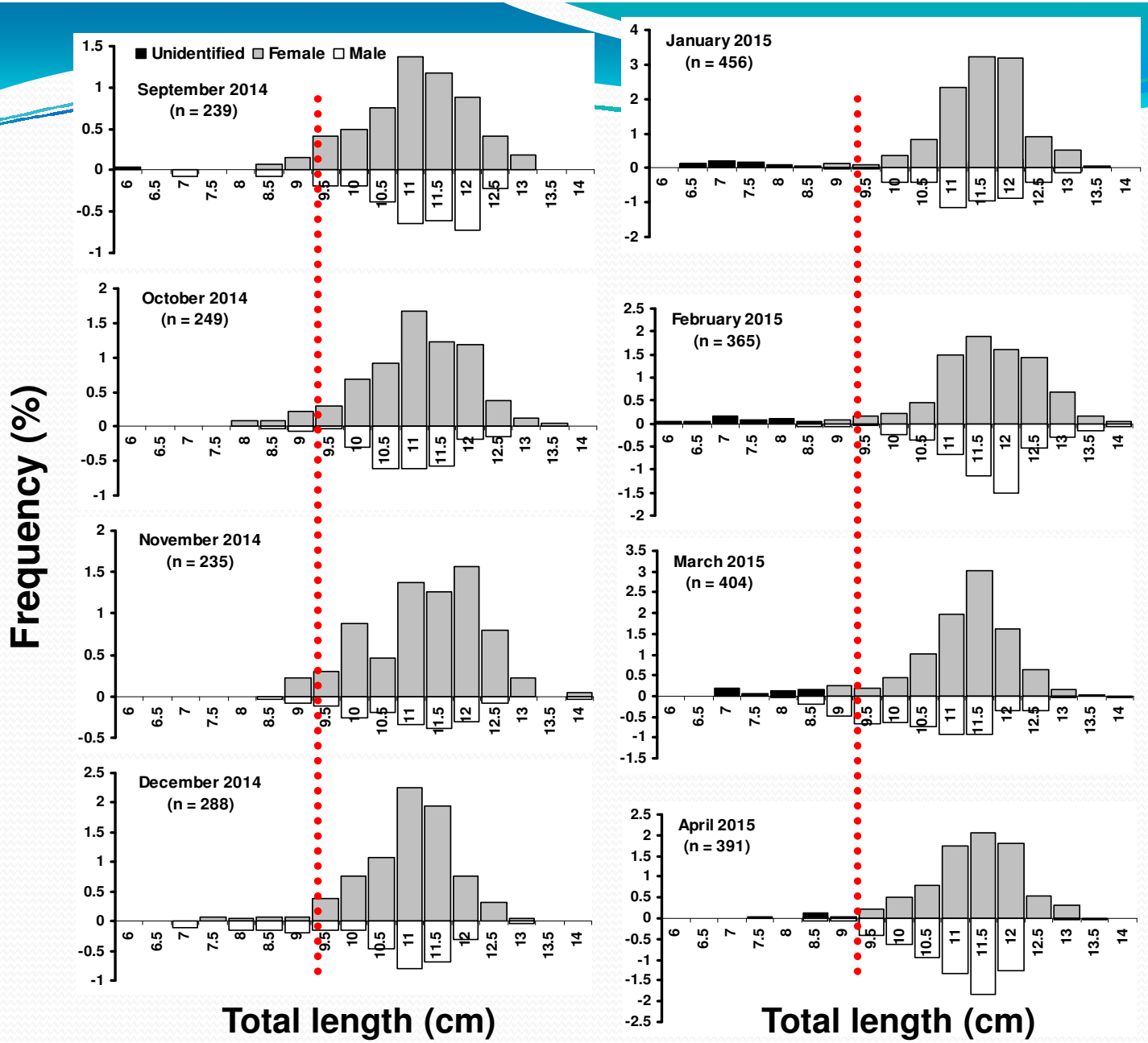


2014 – 2015 fishing season

Length composition



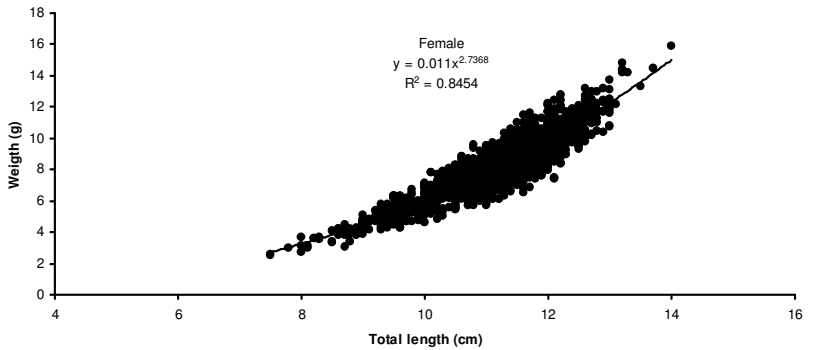
Length (cm)	Unidentified	Female	Male	All
6.0	0.1	0.0	0.0	0.1
6.5	0.2	0.0	0.0	0.2
7.0	0.5	0.0	0.2	0.7
7.5	0.3	0.1	0.0	0.4
8.0	0.3	0.2	0.2	0.6
8.5	0.3	0.3	0.6	1.3
9.0	0.0	1.1	1.0	2.2
9.5	0.1	2.1	1.7	3.8
10.0	0.0	4.3	2.9	7.2
10.5	0.0	6.3	4.1	10.4
11.0	0.1	14.2	6.5	20.8
11.5	0.2	15.8	7.1	23.1
12.0	0.2	12.6	5.5	18.3
12.5	0.0	5.4	1.8	7.2
13.0	0.0	2.2	0.6	2.9
13.5	0.0	0.3	0.2	0.5
14.0	0.0	0.1	0.2	0.2
All	2.6	65.1	32.4	100.0



2014 – 2015 fishing season

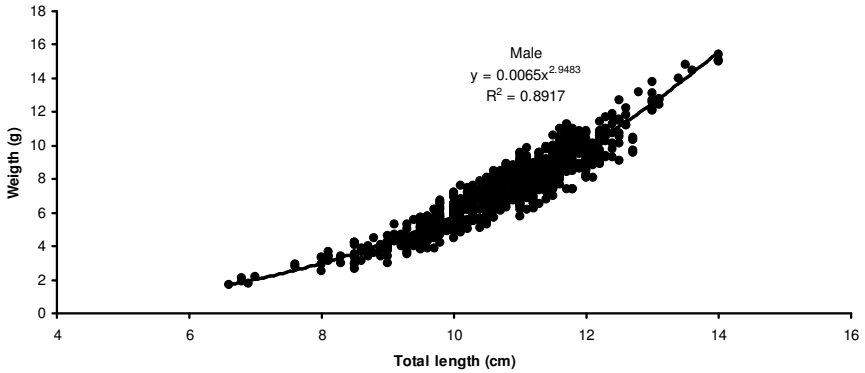
2014 – 2015 fishing season

Length - Weight Relationships



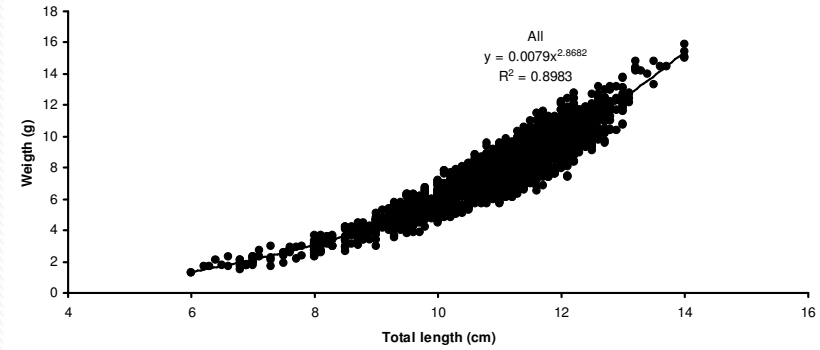
$W = 0.011TL^{2.7368}$, $r^2 = 0.8454$, SdlogL = 0.0362, SdlogW = 0.107798029, N = 1709,

Pauly' t test = 9.291496, P < 0.05, negative allometric growth (Female).



$W = 0.0065TL^{2.9483}$, $r^2 = 0.8917$, SdlogL = 0.0442, SdlogW = 0.137917881, N = 851,

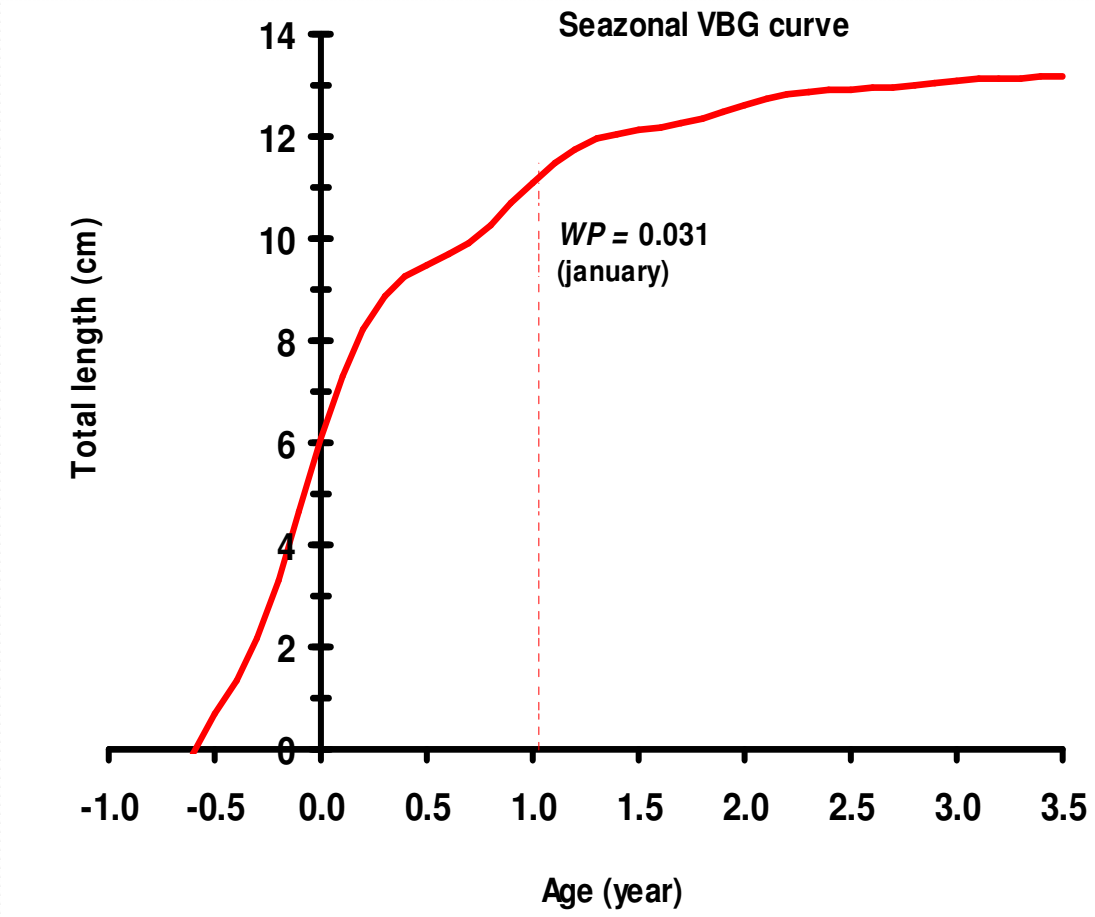
Pauly' t test = 1.466093, P > 0.05, isometric growth (Male).



$W = 0.0079TL^{2.8682}$, $r^2 = 0.8983$, SdlogL = 0.0458, SdlogW = 0.138522039, N = 2627,

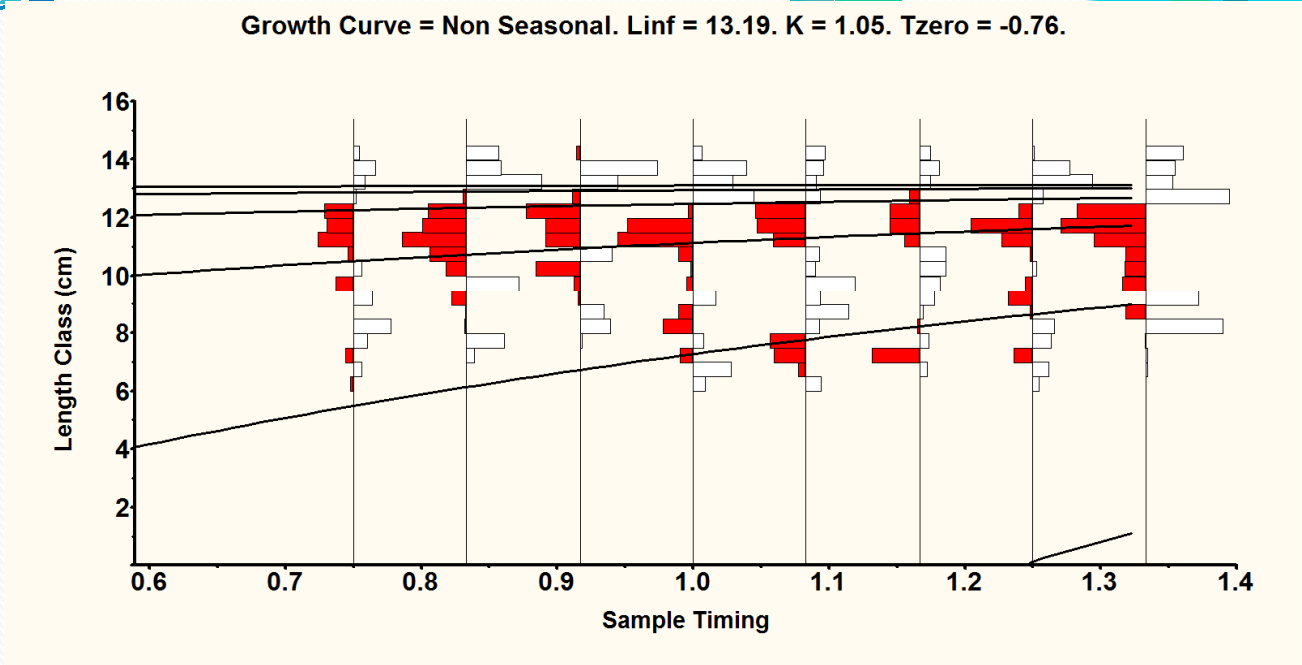
Pauly' t test = 6.997254, P < 0.05, negative allometric growth (All)

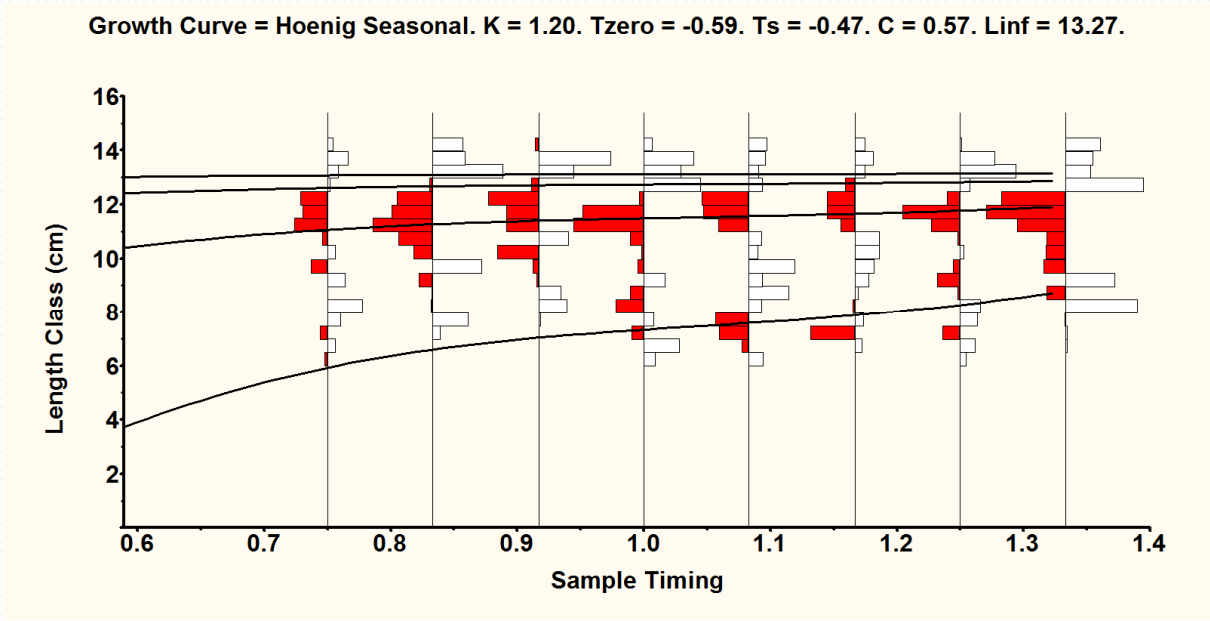
Seasonal growth of Anchovy during 2014 – 2015 fishing season in the Black Sea



	Hoenig Seasonal	Non-Seasonal
L_∞ (cm)	13.272	13.187
K (year-1)	1.200	1.054
t_0 (year)	-0.590	-0.760
t_s	-0.469	
WP	0.031 (Jan.)	
C	0.570	
Rn	0.601	0.531
φ'	2.235	2.263

2014 – 2015 fishing season





Fishing regulation is based on the following criteria *

- Minimum mesh size (there is no regulation for anchovy),
- Minimum fish size (9 cm TL for anchovy),
- Closed season and area [seasonal prohibition protects spawning stocks as it bans the use of bottom and mid-water trawls and purse seines between May and September. Zone restriction refers to the law against fishing within three miles from the coastline]
- Species under full conservation (dolphin, seal, salmon, sea turtle, sponge, corals and sturgeons),
- Completely banned fishing methods and fishing gears,
- Gear restriction for identified species,
- Gear or fishing method restrictions,
- Some restrictions concerning pollutants.

*Düzgüneş, E and Erdoğan, N. Fisheries Management in the Black Sea Countries. Turkish Journal of Fisheries and Aquatic Sciences 8: 181-192 (2008)



Last two years Anchovy in Georgia, hunting and fishing is known to migrate to the coast. However, there is no legal protection measure on anchovies, where heavily anchovy reach breeding size hunted for fish flour and oil mills. This situation is a cause for concern for the future of anchovy stocks.

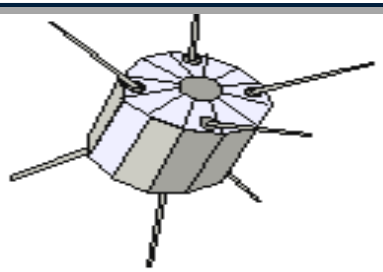




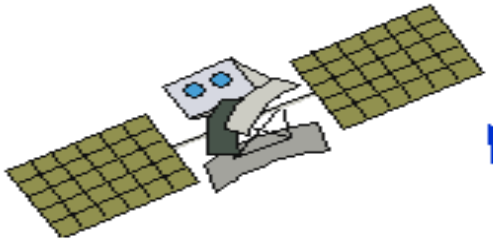
Circulation in the form of the Black Sea, breeding, feeding, migration and hunting all the Black Sea countries, can be common interest to protect the anchovy stocks. Turkey, which has not formed enough to other formal organizations such as the Black Sea countries, the establishment of a common organization, protection and control activities in a transparent manner, will be useful to a dialogue and solidarity.

Under the leadership of the Black Sea Commission and the Black Sea Economic Cooperation community, with the support of scientific research institutions, anchovy stocks and the effective implementation of control measures for the protection and required. Otherwise, large pelagic species in the food chain in the stocks of anchovy fed on the basis of similar problems can occur.

l Monitoring System



Navigation satellite



Communication satellite

VMS - Vessel Monitoring System



Fishing vessel



Land earth station



Patrol vessels and aircraft





National Fisheries Monitoring Centre

Turkish fishermen fishing activities in Georgia, largely in line with the decisions taken by public officials for their advantage when processing actually hunting Turkish fishermen in the waters of that country in which the economic benefit from fully benefiting from questionable.

Because the amount of Georgia by the Turkish anchovy fishermen in the hunt with a certain limitation of certain fishing quotas introduced restrictions.

The main ones were:

(1) By the Government of Georgia reserves of marine living/ created for the purpose of conserving biodiversity 'special marine protected areas hunting is prohibited. Coordinates at detected other than those prohibited.

(2) Within a distance of 300 m from the shore are prohibited.

(3) 7 cm (full size), a small anchovy fishing is prohibited.

(4) Turkish anchovy fishermen hunted only 1/3 of the fresh sent to Turkey. The rest of the prey of the factory in Georgia, as fresh as can be processed or consumed in the domestic market. As a result of the compulsory one-sided agreements, under the leadership of Turkish entrepreneurs today, a total of 8 to 4 each in Poti and Abazya anchovy fish meal and oil processing plants were in operation (Zengin, M., Genç, Y., Ak, O. 2012).

Turkey adopted several international and domestic protection and control regulations for anchovy and other stocks. These regulations are given as, (Anonym, 2013 b);

Sanctions are imposed on those acting against the regulations set for fisheries. These sanctions include; fines, seizure of catch, temporary withdrawal of fishing license and nullification of the fishing license

- For the fishing season 2012-2016, Notification No. 3/1 Regulating Commercial Fisheries and Notification No. 3/2 on Recreational Fishing published in the official gazette and came into force on the 1st of September 2012.

- For purse seine fisheries; min. fishing net depth has been increased from 18 meters to 24 meters.





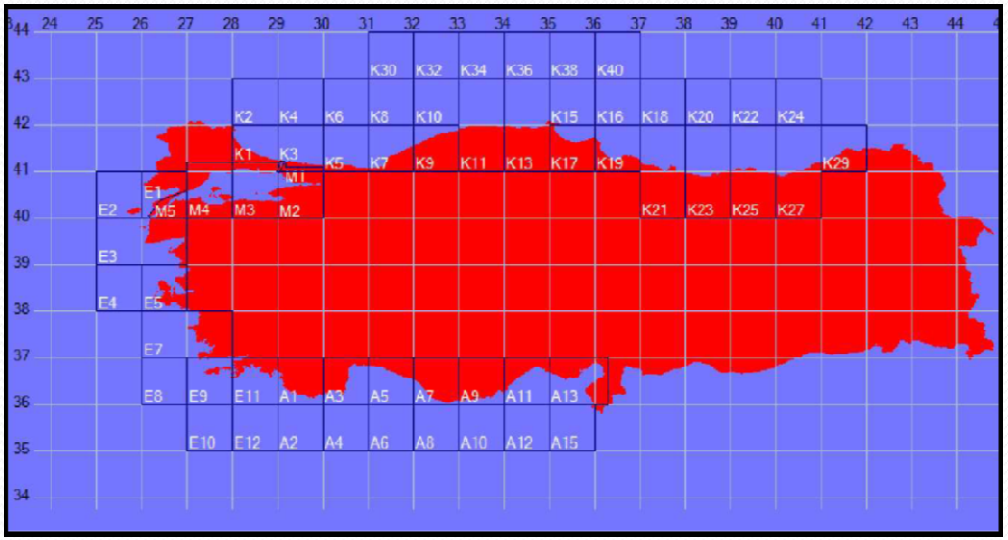
- Fisheries Geographical Information System covering all spatial adjustments regarding fishing zones / fisheries has been established. Satellite - based Vessel Monitoring System (VMS) has continued to be utilized for monitoring of Bluefin-tuna Fishing Vessels.





Through the Automatic Identification System (AIS) of Ministry of Transportation Maritime and Communication, all vessels above 15 meters LoA could be monitored successfully. Technical works started to establish an integrated monitoring system (involving both VMS and AIS) pertaining to MoFAL Development of a suitable monitoring SW is in progress.

In 2013, construction and equipment of an additional Fisheries Port Office will be completed. As of today, total number of Fishing Port Offices has reached to forty two (42).



Meetings of the Fisheries Dialogue Working Group are conducting. 2nd Meeting of the WG took place in Ankara on 10th of May, 2012 and 3rd Meeting of the WG took place in Brussels on 15th of April, 2013. The process intends to strengthen the cooperation in the field of fisheries and to perpetuate the dialogue between Turkey and the EU.

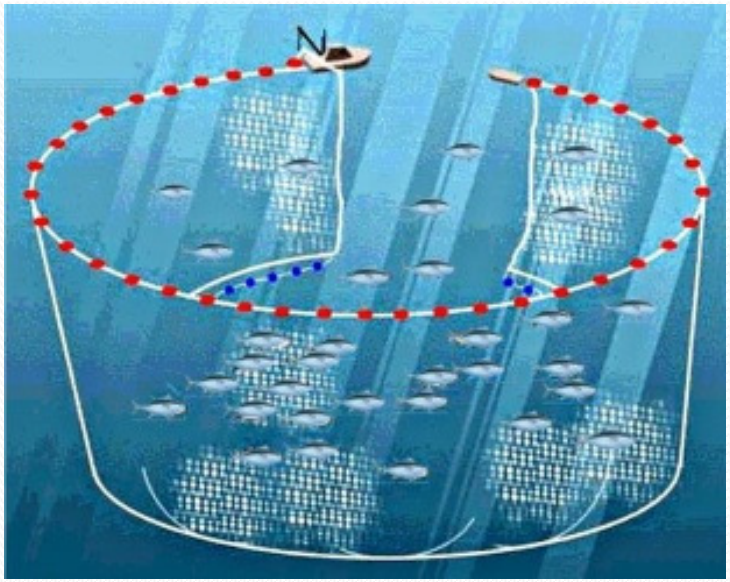


Under the scope of ICCAT Joint Inspection Scheme, Turkish Naval Forces Command and Turkish Coastguard Command have assigned 75 inspection boats/ships and 398 inspector staff to conduct ICCAT inspections during the 2013 fishing campaign.

Turkey has signed the FAO Agreement on 9 November 2010 with endorsement of the Board of Ministers.

As an initial step, a number of landing ports has been designated for port inspections to be conducted under the terms of Agreement and ICCAT Recommendation. Recommendations adopted by ICCAT Commission are transposed into domestic legislation. Rec.12-03 and Rec.09-11 on Eastern Atlantic Bluefin tuna fishery are modified, In 2012, 11 BFT Catching Vessel are issued special fishing licenses and In 2013, 9 BFT Catching Vessel are issued special fishing licenses, due to capacity reduction scheme Rec.11-03 on MED-SWO transposed into legislation





As Turkey, other Black Sea countries shall adopt international regulations in order to protect and control anchovy stocks and all countries of Black Sea Region must apply same regulations together.

Thank you for listening



