Seminar Nasional Universitas Samudera, Langsa
5 September 2018

PERUBAHAN IKLIM DAN DAMPAKNYA TERHADAP INDUSTRI PERIKANAN DAN ADAPTASINYA

Prof. Dr. Muchlisin Z.A., S.Pi, M.Sc
Fakultas Keluatan dan Perikanan
Universitas Syiah Kuala



Zainal A. Muchlisin, Ph.D

Faculty of Marine and Fisheries, Syiah Kuala University,
Kopelma Darussalam, Banda Aceh23111, Indonesia.
Email: muchlisinza@unsyiah.ac.id
Mobile: +62.82160476633

Professor in Fisheries (Fish Biology and Aquaculture)
Place & Date of Birth: Banda Aceh, 11 September 1972

Orchid ID : 0000-0002- 0858- 1853
Scopus author ID : 559373-22900
Scopus H Index : 10
Record in Scopus : 75 papers Citation: 336
Google Scholar h index: 16
Record in GS : 227 Citations: 991
Sinta Score : 51.76

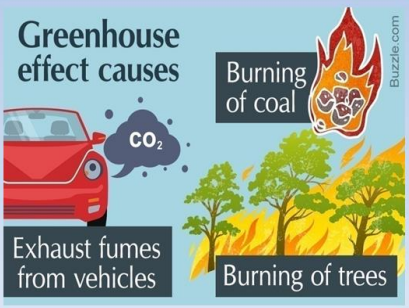
EDUCATION BACKGROUND

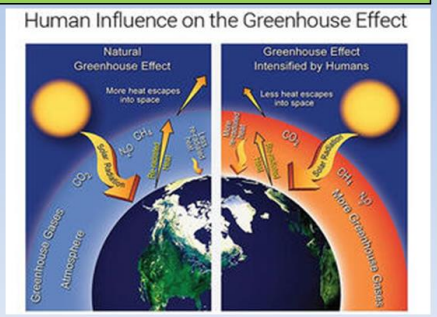
Levels	Field of Study	University	Year
Degree:			
Doktoral (Ph.D)	Ichthyology	Universiti Sains Malaysia, Penang, Malaysia	2011
Master (M.Sc)	Aquaculture	Universiti Sains Malaysia, Penang, Malaysia	2004
Bachelor (S.Pi)	Aquaculture	Riau University, Pekanbaru, Indonesia	1997
Non Degree:			
Certificate	Sustainable Fisheries Management	Monash University, Australia	2014
Certificate	Disaster Risk Reduction	Ritsumeikan University, Japan	2012



GREEN HOUSE EFFECT

- **Causes:**
- **Increases of CO_2, NO, NO_2, CFC etc. in atmosphere**
- **Due to use of fossil fuels higher than the ability of plants to absorb its**
- **Under normal condition, the greenhouse effect is required to mantain the earth temperature (night and day is not too much different)**

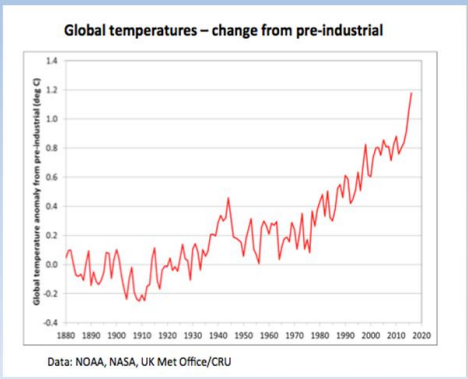


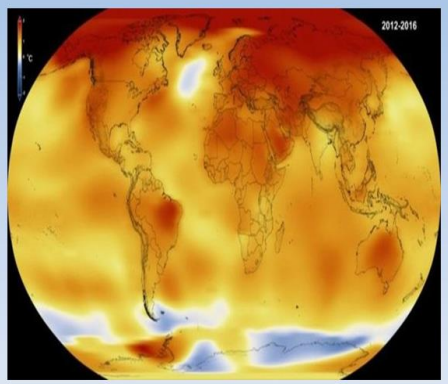


https://helpsavenature.com/greenhouse-effect-diagram

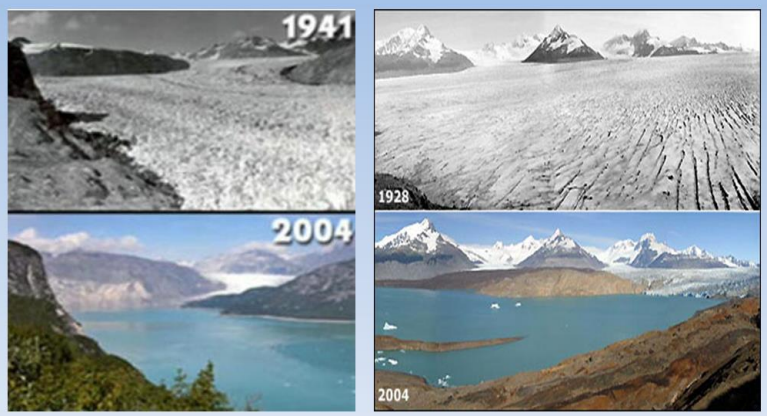
GENERAL IMPACTS OF GREEN HOUSE EFECT

1. Kenaikan rerata suhu bumi → Pemanasan Global → Perubahan iklim





2. Mencair es di kutup menyebabkan kenaikan permukaan air laut dan menurunkan salinitas



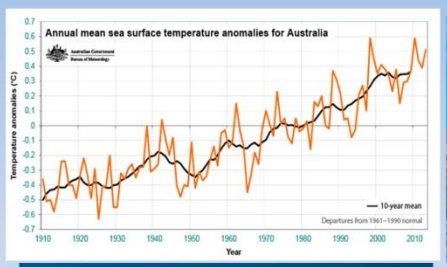
3. Kenaikan permukaan air laut akan menenggelamkan beberapa kota di dunia





http://www.sariminspy.com/2015/09/nasa-rilis-animasi-naiknya-air-laut.html

4. Pemanasan global menyebabkan suhu air laut menyebabkan kematian karang, plankton dll





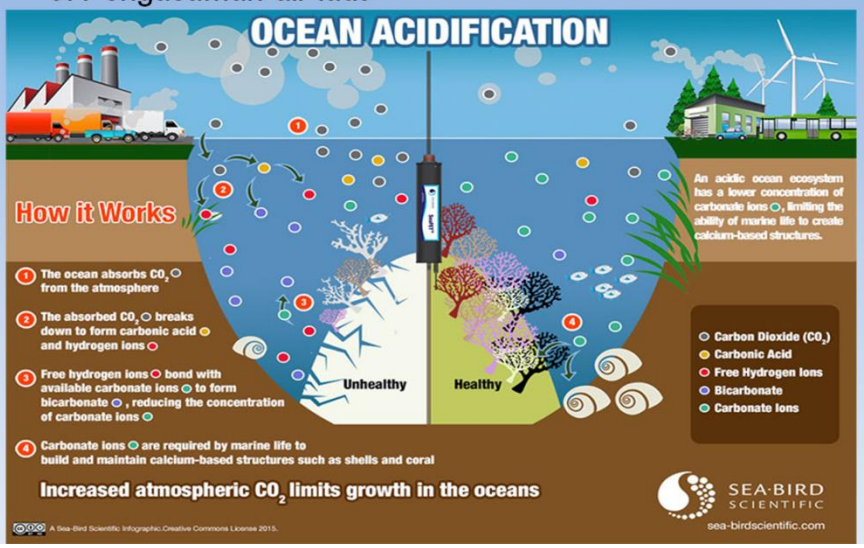


http://takvera.blogspot.co.id/2014/01/sea-surface-temperatures-unusually-warm.html

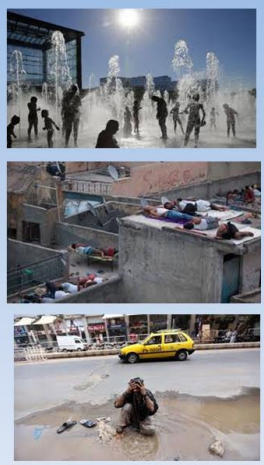


http://www.atollvolunteers.com/coral-bleaching/

5. Pengasaman air laut



6. Gelombang panas



https://kumparan.com/@kumparannews/gelombang-panas-jadikan-sydney-kota-terpanas-di-dunia

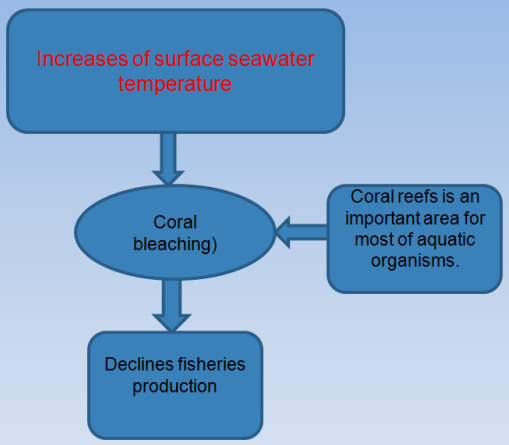


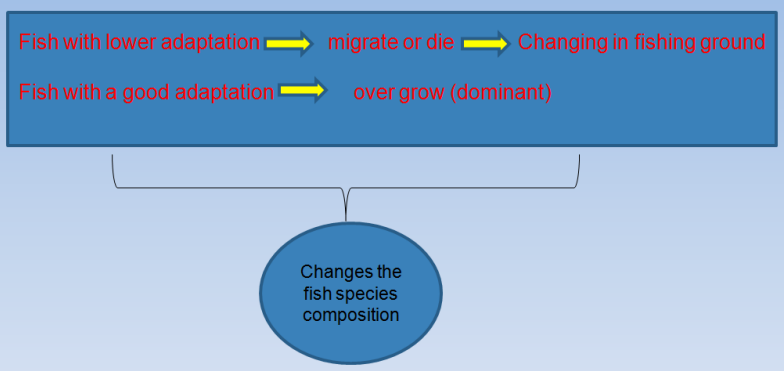
https://international.sindonews.com/read/1106602/40/1-tewas-6-kritis-akibat-gelombang-panas-di-jepang-1462529110

IMPACTS ON FISHERIES SECTOR

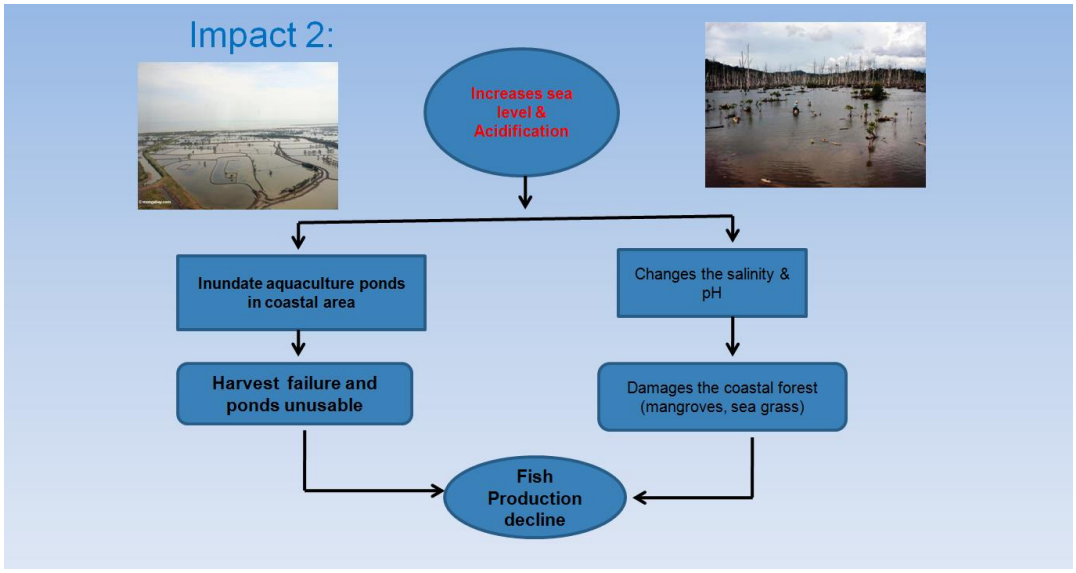
- Global warming lead increases sea water surface temperature, reduces pH and salinity
- These are the crucial factors that influences the plankton life, the changes that factor will lead the reduce of aquatic productivity due to reduce of plankton abundance
- Plankton is a primary producer in aquatic ecosystem and therefore give further negative impact on fish productivity

Impact 1:

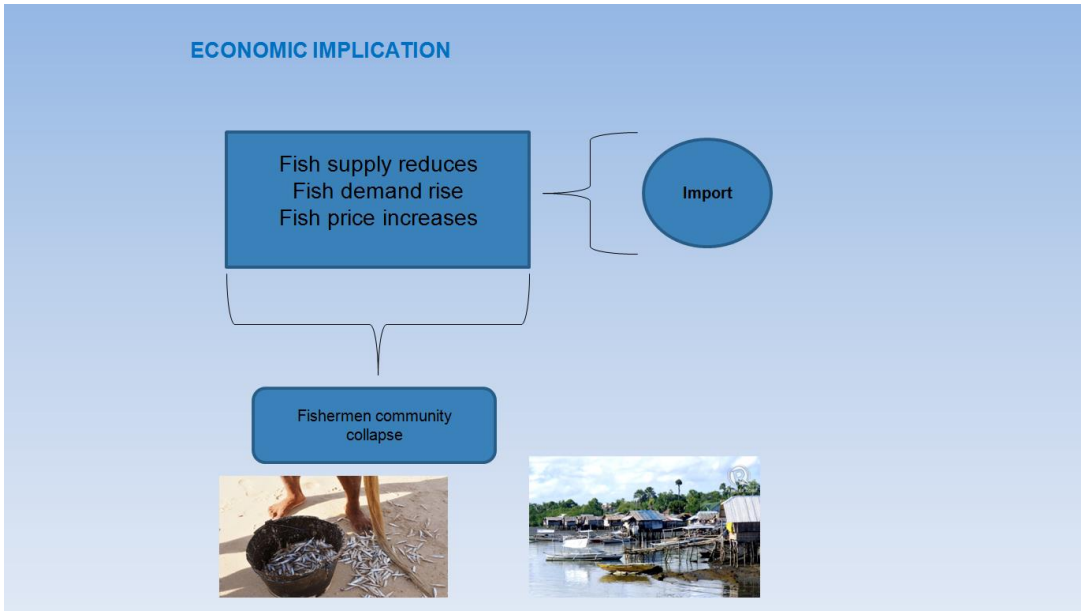




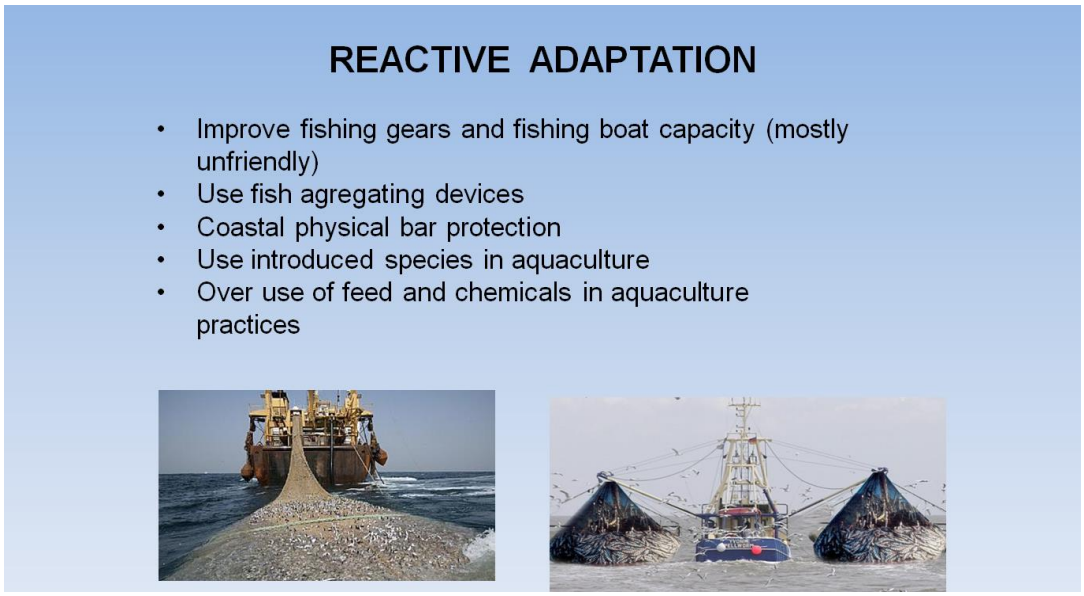
The study predicted that the fish migrate from 40 to 45 km every ten years, so that by 2050 almost common fish in tropical waters like Indonesia will disappear and extinct, or migrating to northern or southern polars


Impact 2:
Increases sea level & Acidification
Inundate aquaculture ponds in coastal area
Changes the salinity & pH
Harvest failure and ponds unusable
Damages the coastal forest (mangroves, sea grass)
Fish Production decline

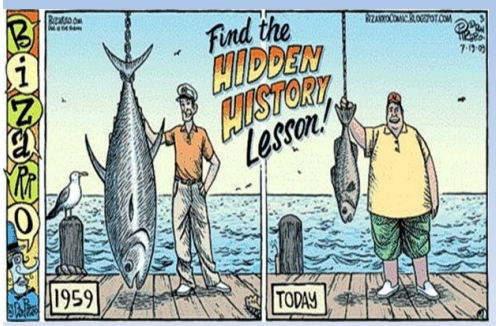

Lost the railway
Changing in water temperature, salinity and pH
Lost orientation and failure for migration of aquatic migrating animals


ECONOMIC IMPLICATION
Fish supply reduces
Fish demand rise
Fish price increases
Import
Fishermen community collapse


FISHERY COMMUNITY ADAPTATION


REACTIVE ADAPTATION
• Improve fishing gears and fishing boat capacity (mostly unfriendly)
• Use fish agregating devices
• Coastal physical bar protection
• Use introduced species in aquaculture
• Over use of feed and chemicals in aquaculture practices

PROACTIVE ADAPTATION (RECOMMENDATIONS)



- Rehabilation of the coral reefs, magroves and sea grass ecosystems
- Development of the Marine Protected Area (MPA)
- Establishmenet of the regulation on the conservation strategy
- Community awereness
- Institutional empowering
- Reduces using fishmeal in the animal feed
- Using high economic value of the indegenous fishes
- Alternative livelihood of the coastal community

BEBERAPA PERMASAALAHAN DALAM BUDIDAYA PERIKANAN

1. Tingginya Harga Pakan
2. Kualitas Bibit Rendah
3. Spesies Asing
4. Penyakit
5. Pencemaran
6. Ketrampilan Petani Ikan Rendah

INTRODUCED SPECIES

- **Insidentil:**
  - Water ballast
  - Driftwood etc.
- **Purposes:**
  - Aquaculture: Increases of fish production, species diversification etc.
  - Hobbies: sport and aquarium
  - Biological Control: pest predation etc

Total number of introduced fish species according to countries.

No	Country	Total number of introduced species	Authors cited
1.	Greece	66 species	Zenetos *et al.*, 2009.
2.	Austria	27 species	Rabitsch and Essl, 2006.
3.	Israel	27 Species	Roll *et al.*, 2007
4	Malaysia	26 species	Chong *et al.*, 2010
5.	Spain	25 species	Ribeiro *et al.*, 2008
6.	India	24 species	Kumar, 2000.
7.	Nepal	23 species	Gurung, 2005.
8.	Singapore	22 species	Tan and Koh-Siang, 2003.
9.	Indonesia	22 Species (43 species)	Wargasasmita, 2005: Asyari 2012 (Umar & Sulaiman, 2013)
10.	Bangladesh	15 species	Islam *et al.*, 2003.

Daftar Ikan yang pernah diintroduksi ke Indonesia (Umar dan Sulaiman, 2013)

No.	Nama Indonesia	Nama Ilmiah	Tahun Introduksi	Asal	Tujuan Introduksi
1	Mas	*Cyprinus carpio*	sebelum 1905	China	Indonesia
2	Nilem	*Osteochilus hasselti*	1937	Tidak diketahui	Irian Jaya
3	Koan	*Ctenopharyngodon idella*	1964	Malaysia, Singapore, Thailan dan Jepang	Indonesia
4	Mola	*Hypophthalmichthys molitrix*	1969	Jepang and Taiwan	Indonesia
5	Karp lumpur cina	*Cirrhinus chinensis*	1969	Taiwan	Indonesia
6	Karper cina	*Hypophthalmichthys*	-	Jepang	Indonesia
7	Karper cina	*Hypophthalmichthys nobilis*	1969	Taiwan	Indonesia
8	Tawes	*Puntius gonionotus*	1963	Tidak diketahui	Irian Jaya
9	Tawes derbang	*Puntius orphoides*	1963	Tidak diketahui	Irian Jaya
10	Carp lumpur	*Cirrhinus molitorella*	-	Jepang	Indonesia
11	Rainbow trout	*Oncorhynchus mykiss*	1929	Belanda	Indonesia
12	Rainbow trout	*Oncorhynchus mykiss*	1983	Tidak diketahui	Irian Jaya
13	Sintik putih/ panchax biru	*Aplocheilus panchax*	Tdk diketahui	Indonesia (disebelah barat garis Wallace)	Indonesia
14	Gurame	*Osphronemus goramy*	1937	Tidak diketahui	Irian Jaya
15	Sepat siam	*Trichogaster pectoralis*	1937	Tidak diketahui	Irian Jaya
16	Sepat siam	*Trichogaster pectoralis*	1930	Malaysia	Indonesia
17	Tambakan	*Helostoma temminckii*	1937	Tidak diketahui	Irian Jaya
18	Tambakan	*Helostoma temminckii*	-	Indonesia (P. Jawa)	Bali
19	Tambakan	*Helostoma temminckii*	-	Indonesia (P. Kalimantan)	Sulawesi
20	Betok	*Anabas testudineus*	Tdk diketahui	Tidak diketahui	Irian Jaya
21	Mujahir	*Oreochromis mossambicus*	1939	Barat Africa	Indonesia
23	Mujahir	*Oreochromis mossambicus*	-	Philipina	Indonesia
23	Nila	*Oreochromis niloticus*	1971	Tidak diketahui	Irian Jaya
24	Nila	*Oreochromis spp.*	1980	Philipina	Indonesia
25	Nila	*Oreochromis niloticus*	Setelah 1980	Taiwan	Indonesia
26	Nila	*Oreochromis niloticus*	-	Philipina	Indonesia
27	Sidat	*Anguilla anguilla*	1992	Inggris, Prancis, Denmark	Indonesia
28	Koki	*Carassius auratus*	Tdk diketahui	China	Indonesia
29	Gabus	*Channa striata*	-	Selatan China	Indonesia
30	Lele dumbo	*Clarias gariepinus*	Pertengahan 1980	Belanda	Indonesia
31	Lele lokal	*Clarias batrachus*	1939	Indonesia (P. Jawa)	Sulawesi
32	Lele dumbo	*Clarias gariepinus*	1986	Afrika Selatan	Indonesia
33	Lele amerika	*Ictalurus punctatus*	1986	Amerika	Indonesia
34	Ikejenis ilawai	*Colossoma macropomum*	1986	Taiwan	Indonesia
35	Ikan nyamuk	*Gambusia affinis*	1929	Italy	Indonesia
36	Sintik mutiara	*Etroplus suratensis*	1979	Malaysia	Indonesia
37	Guppi	*Poecilia reticulata*	1920	Tidak diketahui	Indonesia
38	Salmon	*Salmo salar*	1929	Belanda	Indonesia
39	Salmon	*Salmo trutta fario*	1929	Belanda	Indonesia
40	Tench hijau	*Tinca tinca*	1927	Belanda	Indonesia
41	Pacu	*Piaractus brachypomus*	1985	Taiwan	Indonesia
42	Patin siam	*Pangasius hypophthalmus*	-	Thailand	Indonesia

Beberapa Ikan Alien di PUD Sumatera

No	Alien Species	Provinsi						WWIAFS
		Aceh	Sumut	Riau	Jambi	Sumbar	Sumsel	
1	*Atractosteus spatula* (Alihator gar fish)	√			√			-
2	*Clarias gariepinus* (African catfish)	√		√				
3	*Cyprinus carpio* (Common carp)	√	√	√	√	√	√	12/30
4	*Ctenopharyngodon idella* (Grass carp)	√			√			10
5	*Oreochromis mossambicus* (Tilapa/Mujair)	√	√					30/66
6	*Oreochromis niloticus* (Nile tilapa/nila)	√	√	√	√	√	√	31
7	*Aplocheilus panchax* (Kepala timah)	√						
8	*Pterygoplichthys pardalis* (sapu-sapu)	√		√				42
9	*Xiphophorus helleri* (Plati)	√						57
10	*Collosoma macropomum* (Bawal air tawar)	√						
11	*Trichogaster pectoralis* (Sepat siam)	√					√	
12	*Chana striata* (gabus) ?	√	√	√	√	√	√	
13	*Poecillia reticulata* (ikan seribu)	√	-	-	-	-	-	37
14	*Esomus metallicus*	-	-	√	-	-	-	
	JUmlah	14	4	6	5	3	4	

*100 of the World's Worst Invasive Alien Fish Species (100 WWIAFS)

ALIEN SPECIES DI PERAIRAN ACEH

Oreochromis niloticus



Asal : Africa (Nile basin)
Masuk ke Indonesia: 1969



Clarias gariepinus

Asal: Africa
DiIntroduced ke Indonesia: 1984/1985

Cyprinus carpio



Asal: Europe to Asia
Diintroduksi ke Indonesia: Perkiraan pada 1810 in west Java; 1892 in West Sumatra, Danau Toba pada 1905/1931(Asyari, 2011), 1905

Ctenopharyngodon Idella



Asal: Asia Tengah (China)
Diintroduksi ke Indonesia:
Sumatra 1915 and in Java 1946 (Asyari, 2011), Danau Kerinci 1995 (Asyari, 2011).

Collosoma macropomum



Pic source: www.fishbase.org

Asal: Amazon floodplain (Brazil)
Introduced to Indonesia: 1986

Pangasius sutchi



Pic source: www.fishbase.org

Asal: Asia
Distribution: Mekong, Chao Phraya, and Mekong basins. Introduced into additional river basins for aquaculture
Introduced to Indonesia: 1972 (Hardjamulia & Atmawinata, 1980)

Oreochromis mossambicus (mujair)



Pic source: Ade Arisandi

- Origin: Africa
- Feeding habit: Omnivorous
- Introduced to Indonesia: No precise record (estimated on 1934/1939) in Blitar Jawa Timur, tidak diketahui secara pasti waktunya masuk ke Danau Toba Sumatera diperkirakan pada 1940an.
- Max size : 2.5-3 kg

Channa striata (Bacei)



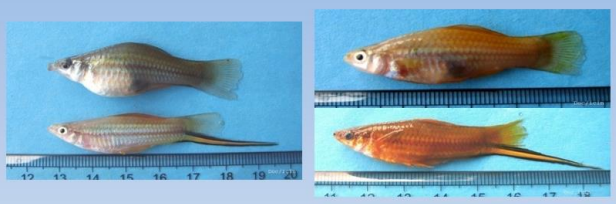
Asal : China (Schuster, 1950 dan Welcomme, 1981)
Introduced to Indonesia: Ancient (no record)

Trichogaster pectoralis (sepat siam)



Asal: Thailand
Introduced to Indonesia: pada tahun 1934 di Jawa (Schuter, 1950), Sumatera Selatan tahun 1953 (Vaas et al. *1953),* Danau Toba tahun1920an (Asyari, 2011)

Xiphophorus helleri (plati)



- Asal : North and Central America
- Introduced to Indonesia: Estimated on 1930

Lyposarcus pardalis (Sapu kaca)



- Origin
- Feeding habit
- Introduced to Indonesia:

Atractosteus spatula (Ikan buaya)



Pic source:
http://en.wikipedia.org/

- Asal: North America
- Introduced to Indonesia:

Poecillia reticulata (ikan seribu/guppy)



Pic source: aquahobby.com & godfather-angel.blogspot.com

- Asal: Amerika Selatan dan Amerika Tengah
- Introduced to Indonesia: Estimated on 1920

Esomus metallicus

Picture source:
http://www.seriouslyfish.com/species/esomus-metallicus/



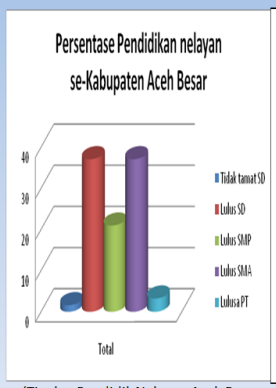
- Asal: Indo Cina dan Semenanjung Malaya
- Introduced to Indonesia: Unknown/no record

Strategi Pengembangan Perikanan Budidaya

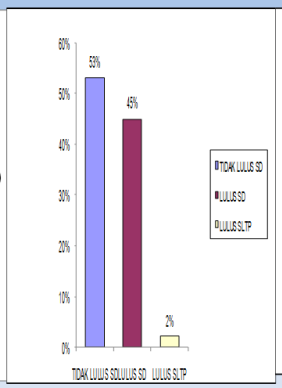
1. Ikan lokal ekonomis tinggi sbg ikan target budidaya, untuk menghindari dampak negatif dari spesies ikan introduksi (tuna, kerapu, kakap, sidat, keureling, cabeh/siganids, bandeng, udang windu dll)
2. Fokus Ikan herbivora, untuk menghindari ketergantungan pada tepung ikan sbg bahan pokok pakan ikan
3. Pakan alternatif, untuk mengantisipasi mahalnya harga pakan

BEBERAPA PERMASAALAHAN DALAM PERIKANAN TANGKAP

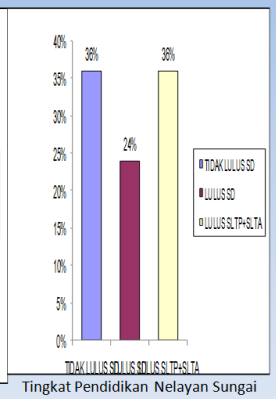
1. Tingkat Pendidikan Relatif Rendah



(Tingkat Pendidik Nelayan Aceh Besar, Muchlisin et at., 2012)

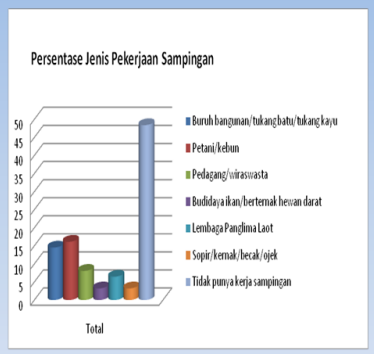


(Tingkat Pendidikan Nelayan Ds Padang Panjang, Susoh, Abdya Mussawir, 2009)



Tingkat Pendidikan Nelayan Sungai Limau Kab. Padang Pariaman (Masri, 2009)

2. Tidak ada ketrampilan tambahan

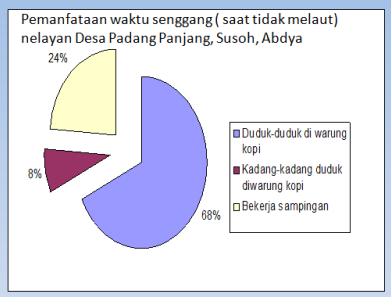


(Muchlisin et at., 2012)



(Mussawir, 2009)

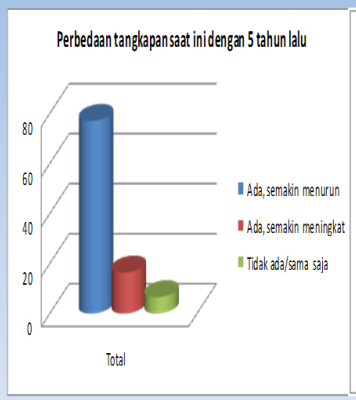
3. Pola Hidup (Manej. Waktu & Keuangan)



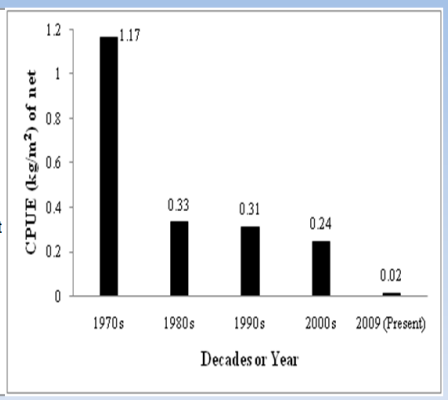
(Mussawir, 2009)

4. Bukan Pemilik Modal

5. Hasil Tangkapan Menurun



Pendapat nelayan Aceh Besar terhadap hasil tangkapan ikan (Muchlisin et al, 2009)

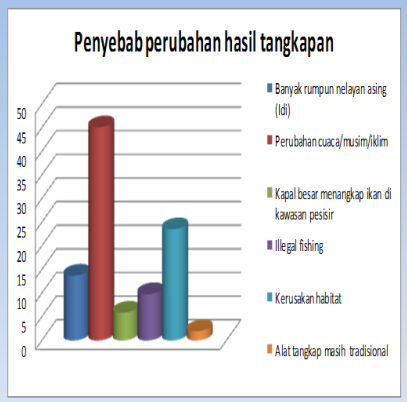


(CPUE) Ikan Depik Dalam Kurun waktu 30 Tahun Terakhir. Data dari wawancara dengan 113 nelayan DLT. (Muchlisin, 2011).

6. Harga BBM Tinggi

No.	Kecamatan	Biaya Operasional/trip dengan BBM subsidi (Rp)	Biaya Operasional/trip dengan BBM non-subsidi (Rp)	Pendapatan rerata/trip (Rp)	Keuntungan dengan subsidi (Rp)	Keuntungan/kerugian tanpa subsidi (Rp)
1.	Baitussalam	1,793,710	2,538,484	3,350,000	1,556,290	811,516
2.	Leupung	940,475	1,378,180	2,528,000	1,587,525	1,149,820
3.	Lhoknga	653,625	1,065,358	1,050,000	396,375	-15,358
4.	Mesjid Raya	154,771	242,615	201,500	46,729	-41,115
5.	Seulimum	96,200	130,102	130,000	33,800	-102
	Rerata	727,756	1,070,948	1,451,900	3,620,719	380,952

7. Perubahan Iklim, Pencemaran, Degradasi Habitat



8. Pencemaran Perairan

Sbg ilustrasi kecil Laut Aceh dicemari oleh 561.228 liter oli bekas setiap tahun

9. Illegal, Unreported and Unregulated (IUU) Fishing

- KKP mengestimasi sebanyak 1.000 kapal asing mencuri ikan di perairan Indonesia setiap tahunnya.
- Kehilangan potensi devisa lebih kurang 30 trilliun rupiah per tahun (slightly over 3 billion U.S. dollars)

Strategi Pengembangan Perikanan Tangkap

- Pemberdayaan nelayan kecil melalui subsidi perikanan dan industri perikanan tangkap dan pengolahan melalui investor
- Pembantukan kawasan-kawan proteksi (marine protected area) sebagai kawasan pemijahan dan pengasuhan biota akuatik
- Peningkatan tingkat pendidikan nelayan melalui penyediaan beasiswa bagi anak nelayan dan penyediaan jalur khusus bagi anak nelayan ke PT
- Ekowisata bahari


TERIMA KASIH
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