# Barophiles OR Peizophiles

- Peizo = Pressure or stress
- phile = loving
- Can grow at high po pressure
- Perpendicular force exerted per unit area
- Atm pressure = Force per unit area exerted by weight of air above the surface

- Hydrostatic pressure = because of H2O
- SI unit of Pressure is Pascal
- 1Pa = 1kg/MS2
- 1 atm = 0.1 MPa

## Classification of Barophiles

- Barotolerant / Baroduric/ Piezotolerant

- Optimal growth at 0.1 MPa
- Can tolerate up to 10 to 40 MPa
- Fresh water and marine water
- E.coli, Pseudomonas

- Obligate Barophiles

- Optimal growth at less than 40 MPa
- Deep oceans, deep sea vertebrates microflora,fishes
- Schewanella sp., Halomonas sp., Pyrodictium sp.

- Extreme Barophiles

- hydrothermal vents with temp 400℃

- Optimal growth at 70 MPa
- Pseudomonas bathycetes = 100 MPa
- Halomonas salaria = 100 MPa

# Depending upon temp and pressure

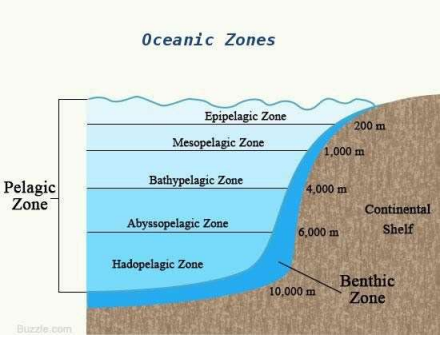
- Piezosychrophiles

- High pressure and low temp
- Deep sea isolates

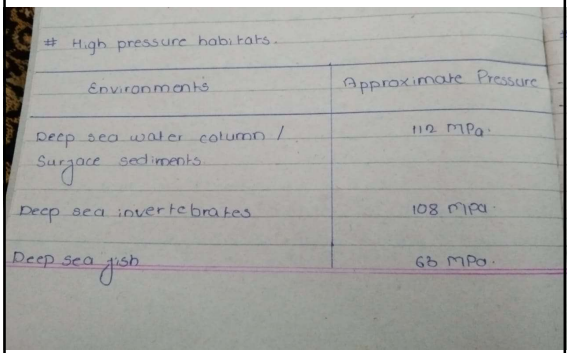
• Piezothermophiles
- high pressure and high temp
- Deep sea hydrothermal vents,oil wells, Terrestrial volcanic area
- Pyrodictium sp., Pyrococcus sp.,Acidi-anus sp.

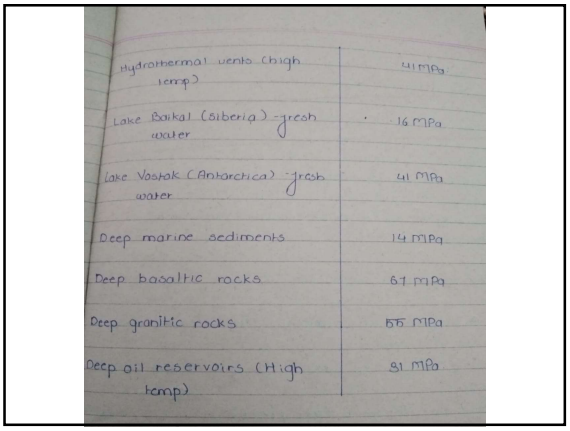
# Habitats

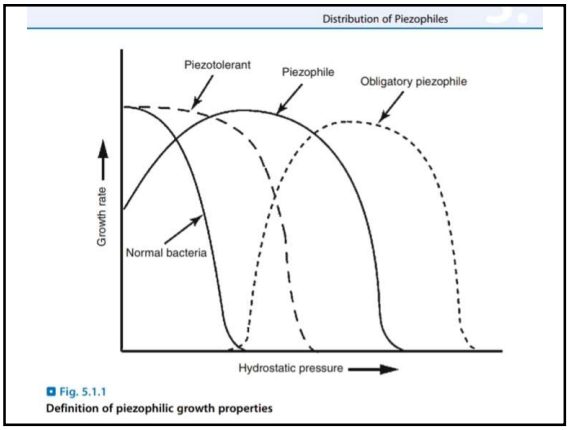
• Deep sea as a habitat
1) Palagic Zones
- Epipelagic zone = Surface of ocean
- Mesopelagic = 200 m
- Bathypelagic = 1000 m
- Abyssopelagic = 4000 m




2) Black smokers
- Temp of magma chamber is 1000℃
- Water temp is 400℃
- Piezothermophiles



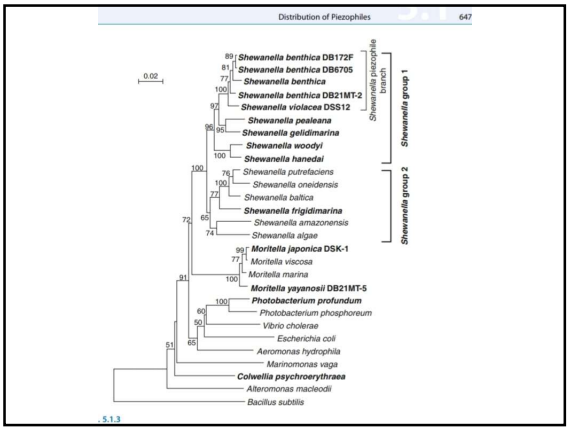


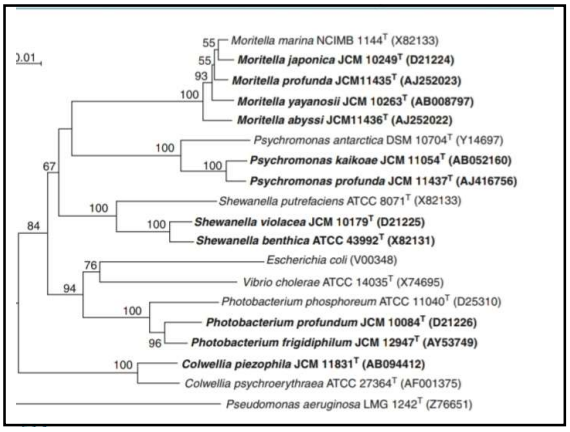




# Distribution and Diversity

- Shewanella sp. are most imp
- Isolated from ocean environment
- Psychrophilic ; Psychrotolerant
- S.benthica and S.violacea ; psychro-philic at atm pressure

- S.gelidimarina and S.fridgimarina
- gamma proteobacteria
- Two major branches
- Group 1 & group II
- I = high pressure and cold adapted
- II = pressure sensitive and mesoph.



## Adaptations

- Some Shewanella produces PUFAs
- Eicosapentaenoic Acid (EPA )
- Group I produces about 11 to 16 % EPA
- For maintaining membrane fluidity
- Photobacterium profundus

- P.frigidium
- Colwellia = Docosahexaenoic acid (DHA)
- Saturated FA instead of PUFA
- Psychromonas kaikoae ; both

## Pressure regulated promoters

- Pressure regulated operon
- Promoter is activated by high P
- Expression is controlled at transcriptional level by pressure
- Sigma 54 RNA Polymerase

- Two component regulatory system
- NtrB and NtrC
- Signal transducing protein
- Bacterial enhancer binding protein
- S.violacea
- NtrB = Pressure sensor
- Auto phosphorylation under high P

- Affect NtrC protein
- Activation of sigma54 dependent promoters

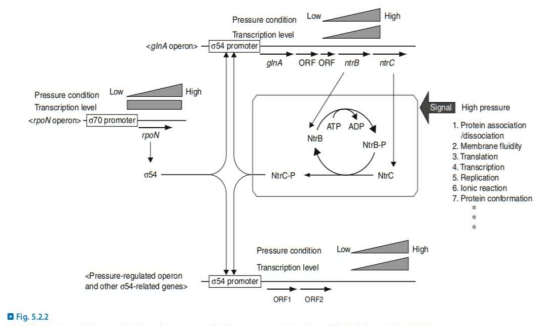



Fig. 5.2.2
**Model for the transcription mechanisms of pressure-regulated gene expression in piezophilic *S. violacea* strain DS512**