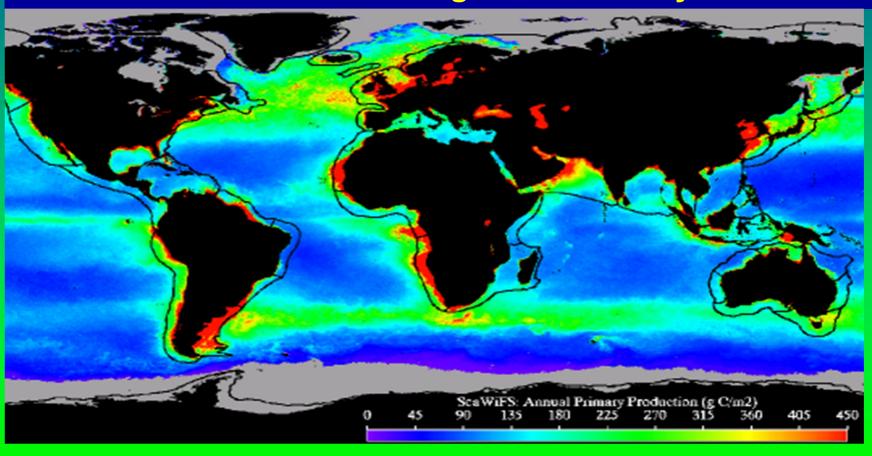
# Pathway To Sustainable Development of the World's Large Marine Ecosystems

Dr. Kenneth Sherman

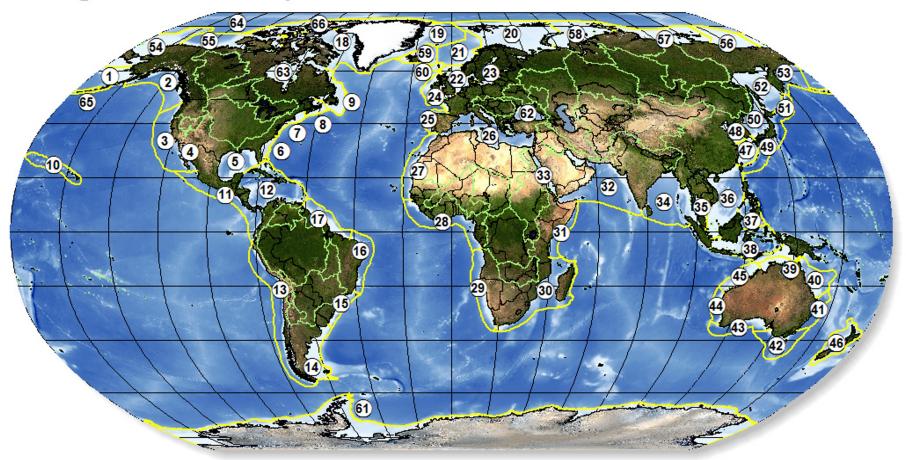
Coastal Resources Center/Graduate School of Oceanography/University of Rhode Island

N.K Panikkar Lecture for 2023 IOC-UNESCO Assembly
June 23rd, 2023
IOC-UNESCO, Paris

# HIGHLY PRODUCTIVE LMEs 80% of the World's Marine Fisheries Catches are produced in LMEs. LMEs contribute \$27.7 trillion annually in ecosystem services to the global economy



#### Large Marine Ecosystems of the World and Linked Watersheds



- 1. East Bering Sea
- Gulf of Alaska
- 3. California Current
- Gulf of California
- 5. Gulf of Mexico
- 6. Southeast U.S. Continental Shelf
- 7. Northeast U.S. Continental Shelf
- 8. Scotian Shelf
- 9. Newfoundland-Labrador Shelf
- 10. Insular Pacific-Hawaiian
- 11. Pacific Central-American
- 12. Caribbean Sea
- 13. Humboldt Current
- 14. Patagonian Shelf

- 15. South Brazil Shelf
- East Brazil Shelf
- 17. North Brazil Shelf
- Canadian Eastern Arctic -West Greenland
- 19. Greenland Sea
- 20. Barents Sea
- 21. Norwegian Sea
- 22. North Sea
- 23. Baltic Sea
- 24. Celtic-Biscay Shelf
- 25. Iberian Coastal
- 26. Mediterranean
- 27. Canary Current

- 28. Guinea Current
- 29. Benguela Current
- 30. Agulhas Current
- 31. Somali Coastal Current
- 32. Arabian Sea
- 33. Red Sea
- 34. Bay of Bengal
- 35. Gulf of Thailand
- 36. South China Sea
- 37. Sulu-Celebes Sea
- 38. Indonesian Sea
- 39. North Australian Shelf
- Northeast Australian Shelf
   East-Central Australian Shelf

- 42. Southeast Australian Shelf
- 43. Southwest Australian Shelf
- 44. West-Central Australian Shelf
- 45. Northwest Australian Shelf
- 46. New Zealand Shelf
- 47. East China Sea
- 48. Yellow Sea
- 49. Kuroshio Current
- 50. Sea of Japan/East Sea
- 51. Oyashio Current
- 52. Sea of Okhotsk
- 53. West Bering Sea 54. Northern Bering-

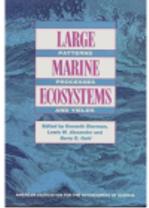
Chukchi Seas

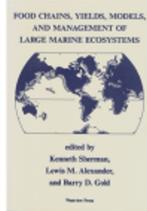
- 55. Beaufort Sea
- 56. East Siberian Sea
- 57. Laptev Sea
- 58. Kara Sea
- 59. Iceland Shelf and Sea
- 60. Faroe Plateau
- 61. Antarctic
- 62. Black Sea
- 63. Hudson Bay Complex
- 64. Central Arctic Ocean
- 65. Aleutian Islands
- 66. Canadian High Arctic-North Greenland

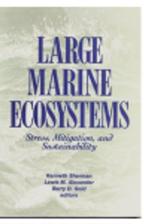


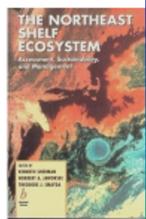
Edited by Remeth Sharmon and Lewis M. Assander

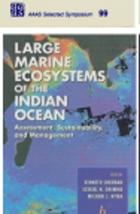


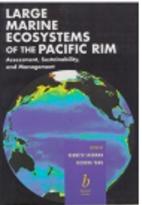








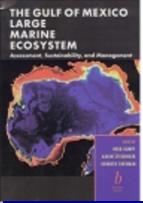


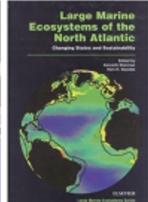


Biomass Yields and Geography

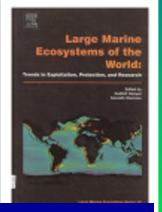
of Large Marine Ecosystems

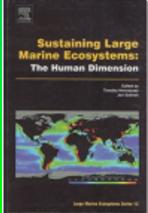
AAAS Salessand Symposium 1111

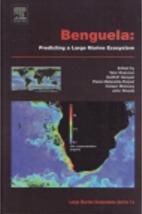












### Seminal LME Volumes Published

### LMEs and UN Movement towards Sustainable Ocean Development

#### **LME Volumes**

**450 Authors** 

American Association for the Advancement of Science, 4 vols. 1986-1993

Blackwell Science, 4 vols. 1996-1999

Elsevier Science, 5 vols. 2002-2006

390 Marine Journal Articles. 1996-2016





United Nations
UNCED 1992
WSSD 2002 EBM support
2012 Rio +20 EBM support
2015 SDG 14 EBM support





### 5 MODULES WITH INDICATORS

#### **Modular Assessments for Sustainable Development**



**PRODUCTIVITY MODULE INDICATORS** 

Photosynthetic activity **Zooplankton biodiversity** Oceanographic variability **Z**ooplankton biomass Ichthyoplankton biodiversity

**POLLUTION ECOSYSTEM** HEALTH FISH **PRODUCTIVITY FISHERIES** 

GOVERNANCE



**POLLUTION & ECOSYSTEM HEALTH MODULE INDICATORS** 

**Eutrophication** 

**Biotoxins** 

**Pathology** 

**Emerging disease** 

**Health indices** 

Multiple marine ecological

disturbances



SOCIOECONOMIC MODULE **INDICATORS Integrated assessments Human forcing** Sustainability of long-term

socioeconomic benefits



**FISH & FISHERIES MODULE INDICATORS Biodiversity Finfish** Shellfish

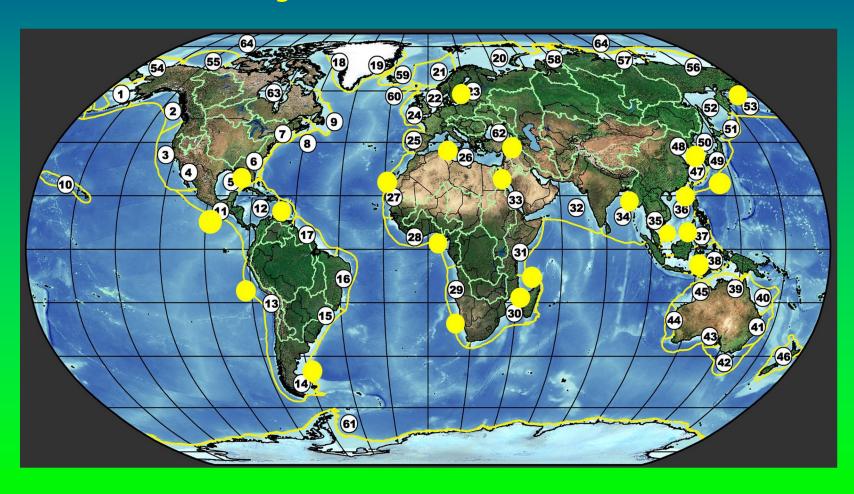
**Demersal species Pelagic species** 





SOCIOECONOMICS

# 110 Participating Countries 22 LMEs with GEF Supported EBM Projects since 1994



## GEF LME International Waters Projects Operational Strategy

Transboundary
Diagnostic Analyses
TDAs

Strategic Action
Program
SAPs



Supports
LME
Approach
to EBM

### **Engaging with partners**

- 5 UN Agencies
  - UNDP
  - UNEP
  - UNIDO
  - FAO
  - IOC UNESCO
- 2 NGOs
  - IUCN
  - WWF
- 2 Global Financial Institutions
  - Global Environment Facility
  - World Bank
- 4 OECD Countries-U.S, Norway, Sweden, Germany