The background of the slide features a light blue to medium blue gradient. Scattered across this background are numerous water droplets of various sizes. Some droplets are large and prominent, while others are small and subtle. They are rendered with soft shadows and highlights, giving them a three-dimensional appearance as if they are floating or about to fall.

# COMMUNICATION BETWEEN MARINE MAMMALS: UNDERSTANDING THEIR SOCIAL STRUCTURE

BY: MORGAN HARRISON

# INTRODUCTION

- MARINE MAMMALS ARE ONE GROUP OF ANIMALS THAT INCLUDE DOLPHINS, WHALES, SEALS, MANATEES, AND SEVERAL OTHER SPECIES
- THEIR INTELLIGENCE MAKES THEM RELY MOSTLY ON VOCAL AND NON-VOCAL COMMUNICATIONS TO COPE WITH THE ENVIRONMENT, FORM SOCIAL TIES, AND COORDINATE ACTIVITIES
  - DOLPHINS WHISTLE AND CLICK, WHALES ARE FAMOUS FOR THEIR SONGS, AND SEALS BARK OR GROWL TO CONVEY MESSAGES
- THE STUDY OF COMMUNICATION AND SOCIAL STRUCTURES IN MARINE MAMMALS IS IMPORTANT FOR A NUMBER OF REASONS
  - IN ADDITION TO LEARNING HOW DIFFERENT SPECIES INTERACT AND COEXIST, IT PROVIDES A BETTER UNDERSTANDING OF THEIR MIGRATION PATTERNS, REPRODUCTIVE BEHAVIORS, AND RESPONSES TO ENVIRONMENTAL CHANGES.

# TYPES OF MARINE MAMMALS

- CETACEANS: SPINE LIKE BODY SHAPE, VESTIGIAL HIND LIMBS, FROM LIMB FLIPPERS THAT LACK CLAW OR FINGERS, HAIRLESS WITH NO SWEAT GLANDS, THICK LAYERS OF FAT TO KEEP WARM, CANNOT SURVIVE ON LAND
  - WHALES
  - DOLPHINS
- PINNIPEDS: TORPEDO SHAPED BODY WITH WIDE TORSOS AND NARROW HINDQUARTERS, SHORT STURDY FLIPPERS WITH CLAWS ON THE FORE FLIPPERS, SMALL FRONT FLIPPERS LIMIT MOVEMENT ON LAND, CAN SURVIVE LONG PERIODS OF TIME ON LAND
  - SEALS
  - SEA LIONS
- SIRENIANS: TWO FRONT FLIPPER LIMBS WITH ONE LARGE FLIPPER ON THE BACK, THICK SKIN WITH LITTLE HAIR, CAN HAVE SIMILAR CHARACTERISTICS AS CETACEANS
  - MANATEES




# DIFFERENT TYPES OF COMMUNICATION

- VOCAL COMMUNICATION

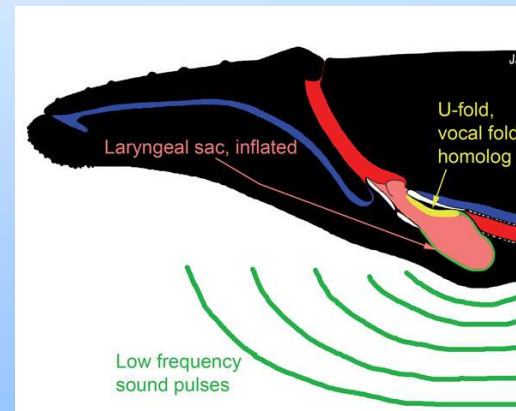
- THIS INCLUDES WHISTLES, CLICKS, SONGS, CALLS, AND OTHER FORMS OF VOCALIZATIONS
- CAN ALSO INCLUDE BARKS, GROWLS, AND GRUNTS, WHICH ARE USED FOR A RANGE OF PURPOSES SUCH AS MATING CALLS, TERRITORIAL SIGNALS, AND ALERTS TO THE PRESENCE OF PREDATORS.

- NON-VOCAL COMMUNICATION

- MARINE MAMMALS PRIMARILY DEPEND ON BODY LANGUAGE FOR COMMUNICATION. IT RANGES FROM BREACHING TO SLAPPING THE TAIL AND SPY-HOPPING
  - DOLPHINS CAN FORM BUBBLE RINGS AND OTHER SHAPES WITH THE ABILITY TO DENOTE PLAYFULNESS, CURIOSITY, OR EVEN AGGRESSION
- 

# VOCAL COMMUNICATION

- DOLPHINS ARE WELL-KNOWN FOR THEIR DISTINCTIVE WHISTLES AND CLICKS USED FOR ECHOLOCATION AND SOCIAL INTERACTION
- WHALES, ESPECIALLY HUMPBACK WHALES, PRODUCE ELABORATE SONGS THAT CAN TRAVEL GREAT DISTANCES UNDERWATER




# NON-VERBAL COMMUNICATION

- TACTILE COMMUNICATION IS VITAL IN TERMS OF BONDING, AND IN THE CASE OF MOTHERS AND THEIR YOUNG. TOUCHING, RUBBING, AND OTHER WAYS OF PHYSICAL CONTACT REINFORCE SOCIAL TIES AND SOOTHE FEELINGS





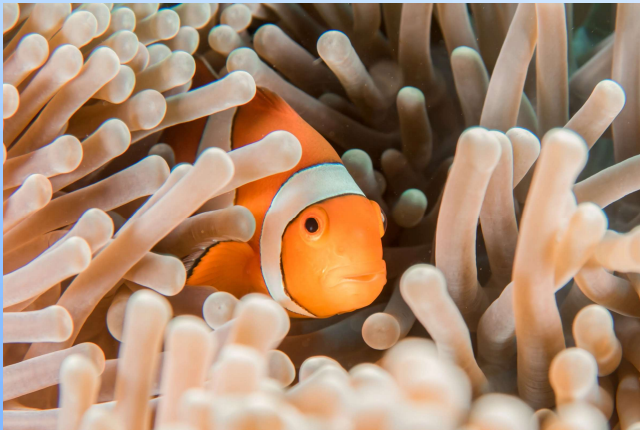
# SOCIAL STRUCTURE IN MARINE MAMMALS

- MARINE MAMMALS SPAN A WIDE RANGE OF SOCIAL STRUCTURES, FROM HIGHLY ORGANIZED GROUPS TO SOLITARY LIFESTYLES
  - THE SOCIAL STRUCTURES OF DOLPHINS CAN BE QUITE DYNAMIC, AND THE INDIVIDUALS HAVE VERY STRONG AND LONG-LASTING RELATIONS, SOMEWHAT LIKE FRIENDSHIPS IN HUMANS
  - HUMPBACK WHALES ARE USUALLY SOLITARY ANIMALS THAT COME TOGETHER ONLY DURING THE FEEDING AND MATING SEASONS
- 



# COMMUNICATION AND SOCIAL BONDS

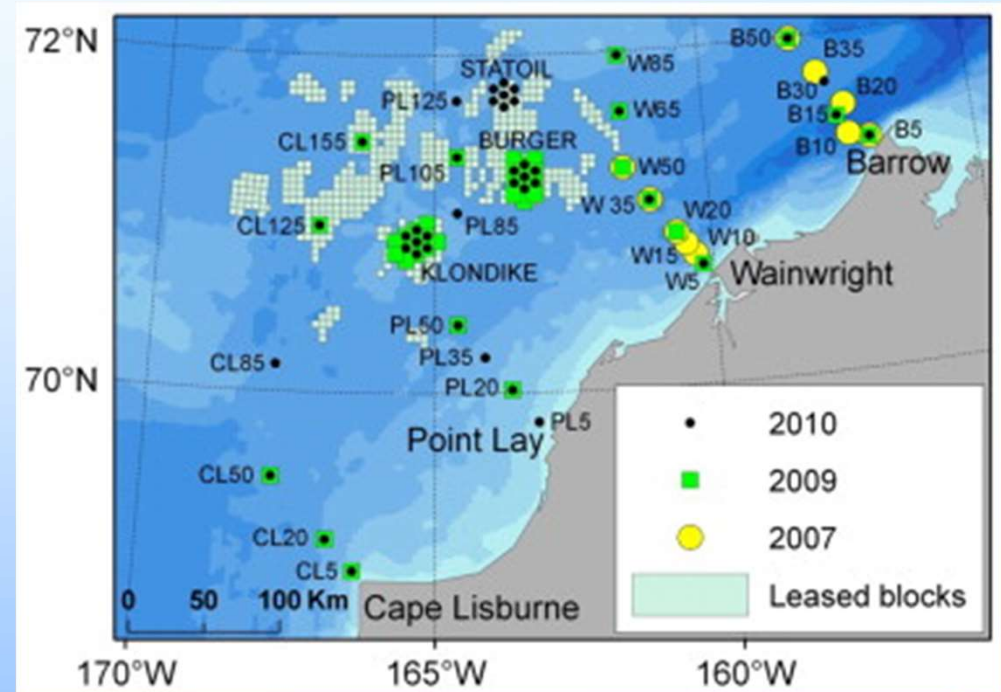
- SOCIAL RELATIONSHIPS AMONG MARINE MAMMALS ARE AN ESSENTIAL INGREDIENT TO THEIR SURVIVAL AND LIFESTYLE. IN MOST SPECIES, CONSIDERABLE BONDS EXIST BETWEEN MOTHERS AND OFFSPRING. A BABY WHALE WILL HAVE NO PROBLEM IN RECOGNIZING ITS MOTHER'S CALL





## CASE STUDY

- THIS INTENSIVE MONITORING PROGRAM, AS DESCRIBED IN FIGURE 1, CONSISTED OF DEPLOYMENTS OF RECORDING STATIONS IN EACH OF THE THREE MAIN STUDY AREAS: BURGER, KLONDIKE, AND STATOIL
- “ARRAYS OF AUTONOMOUS ACOUSTIC RECORDERS WERE DEPLOYED IN THE NORTHEASTERN CHUKCHI SEA TO MONITOR NEARLY CONTINUOUSLY FROM JULY 2007 TO AUGUST 2011” (HANNAY 2013).



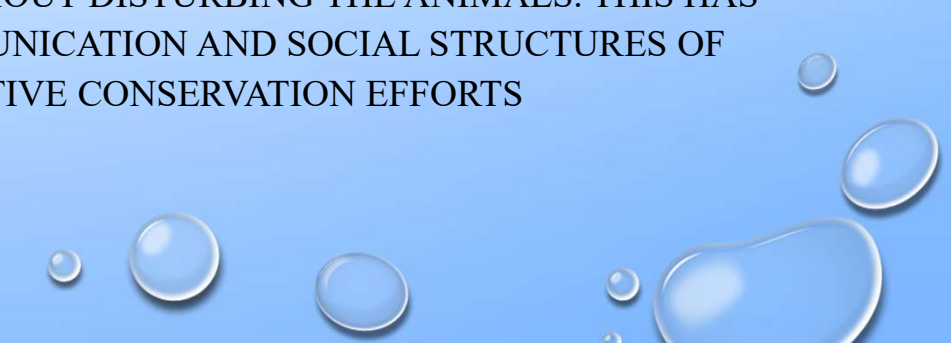
The background of the slide is a light blue gradient. It is decorated with several realistic water bubbles of various sizes. Some bubbles are at the top left, some at the top right, and a cluster of larger bubbles is at the bottom right. The bubbles have highlights and shadows, giving them a 3D appearance.

# CLIMATE EFFECT ON MARINE MAMMAL COMMUNICATION AND SOCIAL STRUCTURES

- THE LOSS OF SEA ICE TO SPECIES SUCH AS POLAR BEARS, SEALS, AND WALRUSES IS NOT ONLY DESTRUCTION TO THEIR HOME BUT ALSO AFFECTS THEIR SOCIAL STRUCTURES AND WAYS OF COMMUNICATION
- WITH CLIMATE CHANGE, OCEAN CURRENTS AND WATER TEMPERATURES ARE ALTERED, THUS DISRUPTING THE NORMAL COURSE OF MIGRATIONS. THE CONSEQUENCE COULD BE A LACK OF COMMUNICATION BECAUSE GROUPS MAY BE SEPARATED, OR THIS MAY INVOLVE HAVING TO ADOPT NEW WAYS OF COMMUNICATING IN UNFAMILIAR ENVIRONMENTS



# HUMAN IMPACT ON MARINE MAMMALS COMMUNICATION

- HUMAN ACTIVITIES HAVE DISRUPTED THE NATURAL COMMUNICATION CHANNELS OF MARINE MAMMALS, POSING BOTH CHALLENGES AND OPPORTUNITIES FOR THEIR CONSERVATION AND WELL-BEING
  - PAST RESEARCH INTO MARINE MAMMALS SOMETIMES USED INVASIVE TECHNIQUES AND EVEN APPROACHES CONSIDERED UNETHICAL TODAY, WHICH HAS TAKEN ITS TOLL ON THE POPULATIONS OF THESE CREATURES
  - NON-INVASIVE TECHNIQUES, SUCH AS PASSIVE ACOUSTIC MONITORING, ENABLE SCIENTISTS TO MONITOR VOCALIZATIONS AND BEHAVIORS WITHOUT DISTURBING THE ANIMALS. THIS HAS LED TO A GREATER UNDERSTANDING OF THE COMMUNICATION AND SOCIAL STRUCTURES OF MARINE MAMMALS, THUS INFORMING MORE EFFECTIVE CONSERVATION EFFORTS
- 


# TECHNOLOGY BENEFITS AND CONSEQUENCES WITHIN RESEARCH

- VESSELS PRODUCE DIFFERENT KINDS OF SOUNDS, FROM LOW FREQUENCY TO HIGH FREQUENCY, WHICH MAY INTERFERE WITH VARIOUS CLICKS, WHISTLES, AND CALLS THAT MARINE MAMMALS USE.
- ADVANCED TECHNOLOGY CAN FACILITATE COMMUNICATION BETWEEN DIFFERENT MARINE MAMMAL SPECIES. FOR EXAMPLE, UNDERWATER COMMUNICATIONS DEVICES THAT MIMIC THE SOUNDS OF DIFFERENT SPECIES CAN ENABLE INTERACTIONS THAT ARE OTHERWISE NOT POSSIBLE.





# CONCLUSION

- MARINE MAMMALS HAVE AN INCREDIBLY RICH ARRAY OF VOCAL AND NON-VOCAL COMMUNICATIVE ABILITIES, WHICH ARE CENTRAL TO THEIR SURVIVAL AND SOCIAL INTERACTIONS
  - SOCIAL STRUCTURES AMONG MARINE MAMMALS REFLECT THE GREAT DEAL OF IMPORTANCE ATTACHED TO MAINTAINING COMMUNICATION FOR THEIR SOCIAL BONDS
  - THE STUDY OF MARINE MAMMAL COMMUNICATION AND SOCIAL STRUCTURES IS NOT ONLY FASCINATING BUT ALSO IMPORTANT FOR CONSERVATION
- 

# REFERENCES

- BEST, P. B. (1979). SOCIAL ORGANIZATION IN SPERM WHALES, *PHYSETER MACROCEPHALUS*. IN *BEHAVIOR OF MARINE ANIMALS: CURRENT PERSPECTIVES IN RESEARCH* (PP. 227-289). BOSTON, MA: SPRINGER US.
- BILL AMOS ET AL., SOCIAL STRUCTURE OF PILOT WHALES REVEALED BY ANALYTICAL DNA PROFILING. *SCIENCE* 260, 670-672 (1993). [HTTPS://DOI.ORG/10.1126/SCIENCE.8480176](https://doi.org/10.1126/science.8480176)
- CONNOR, R. C., MANN, J., TYACK, P. L., & WHITEHEAD, H. (1998). SOCIAL EVOLUTION IN TOOTHED WHALES. *TRENDS IN ECOLOGY & EVOLUTION*, 13(6), 228-232. [HTTPS://DOI.ORG/10.1016/S0169-5347\(98\)01326-3](https://doi.org/10.1016/S0169-5347(98)01326-3)
- HANNAY, D. E., DELARUE, J., MOUY, X., MARTIN, B. S., LEARY, D., OSWALD, J. N., & VALLARTA, J. (2013). MARINE MAMMAL ACOUSTIC DETECTIONS IN THE NORTHEASTERN CHUKCHI SEA, SEPTEMBER 2007–JULY 2011. *CONTINENTAL SHELF RESEARCH*, 67, 127-146.
- WELLS, R.S., SCOTT, M.D., IRVINE, A.B. (1987). THE SOCIAL STRUCTURE OF FREE-RANGING BOTTLENOSE DOLPHINS. IN: GENOWAYS, H.H. (EDS) *CURRENT MAMMALOGY*. SPRINGER, BOSTON, MA. [HTTPS://DOI.ORG/10.1007/978-1-4757-9909-5\\_7](https://doi.org/10.1007/978-1-4757-9909-5_7)