

CURRICULUM VITAE

Name: Stephen Andrew Watts

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Birth Date: September 9, 1957 - Roanoke, VA

Education:

Postdoctoral Fellowship. 1986-1988. University of New Hampshire and The State University of Utrecht, The Netherlands. Research: "Chemical Control of Spermatogenesis in a Sea Star Model".

Ph.D. 1986. Biology. University of South Florida. Dissertation: "Metabolic Changes in the Pyloric Caeca During the Annual Reproductive Cycle of *Luidia clathrata* (Echinodermata: Asteroidea)".

M.A. 1981. Zoology. University of South Florida. Thesis: "Biochemical Response to Temperature in the Sea Star *Echinaster* sp. (Muller and Troschel) (Echinodermata: Asteroidea)".

B.S. 1979. Marine Science. Auburn University.

Professional Experience:

Research:

Visiting Scientist (Fall, 2004): Texas A&M Experimental Station, Port Aransas, Texas. Nutritional requirements of aquatic biomedical research models.

Graduate Program Director (2000-): Department of Biology, University of Alabama at Birmingham

Professor (1998-present): Department of Biology, University of Alabama at Birmingham

Associate Professor (1993-98): Department of Biology, University of Alabama at Birmingham

Assistant Professor (1988-93): Department of Biology, University of Alabama at Birmingham.

Postdoctoral Fellow (1986-1988): Department of Zoology, University of New Hampshire.

Visiting Scientist (Spring, 1987): Department of Comparative Physiology, University of Utrecht, The Netherlands. Techniques in steroid chemistry.

Visiting Scientist (Summer, 1986): Department of Biology, University of Victoria, British Columbia. Techniques in monoclonal antibodies.

Associate Director SEAWATCH Program (1983-1984): Florida Institute of Oceanography. Marine organismal surveys of Tampa Bay, Florida.

Research Assistant (1981-1982): Department of Biology, University of South Florida. Funded by Department of Natural Resources. Water chemistry of Florida freshwater lakes.

Research Assistant (1980): Department of Biology, University of South Florida. Biochemistry of water plants in Florida lakes.

Professional Experience (continued)

Undergraduate Research Assistant (1979): Department of Biology, Auburn University. Studies in the biology of tardigrades. Mentor – Dr. William Mason.

Teaching:

Assistant, Associate, Full Professor (1987-): Department of Biology, University of Alabama at Birmingham. Courses: BY 105 Introductory Biology; BY 330 Cell Biology; BY 671,771 Biochemical Adaptation; BY 685, BY 785 Seminar in Cell Biology; BY 397, 398, 399 Advanced Directed Readings, Undergraduate Research and Honor's Research.

Instructor (1985): Sex, Reproduction, and Population, Department of Biology, University of South Florida.

Teaching Assistant (1979-1984): Department of Biology, University of South Florida. Courses: Fundamentals of Biology, Fundamentals of Zoology, Animal Physiology, Cell Biology.

Research Interest:

Nutrition sciences; Aquatic biomedical research models (sea urchins, zebrafish and killifish); Obesity; Physiology and nutrition of growth and stress in aquatic organisms; Steroid metabolism and physiology; Environmental and hormonal control of growth and reproduction; Physiological ecology; Toxicology; Aquaculture; Sustainable technologies.

Professional Societies:

American Association Advancement Science
Society for Integrative and Comparative Biology
International Society of Invertebrate Reproduction
The Crustacean Society
American Tilapia Association
International Association Astacologists
World Aquaculture Society
Florida Academy of Sciences
Alabama Academy of Sciences
Sigma Xi
Phi Sigma Biological Honor Society
Alpha Zeta Honor Society
Golden Key Honor Society

Professional Awards and Activities:

1979-1985 Tuition Fellowship, University of South Florida
1983-5 Member, Department of Biology, USF, Curriculum Committee
1983-5 Member, Department of Biology, USF, Liaison Committee
1985 Outstanding Graduate Student Research Award, University of South Florida Chapter of Sigma Xi
1986-8 Member, Marine Biomedical Research Group, University of New Hampshire
1998-present Member, Graduate Affairs Committee, UAB
1989 Co-organizer, National Echinoderm Workshop/Symposium, Dauphin Island
1982-present Reviewer for Numerous National and International Science Journals
1989-present Faculty Sponsor, Gamma Theta Chapter of Phi Sigma Biological Honor Society
1991 Omicron Delta Kappa Faculty Leadership Honorary
1991 Nominee for University Award for Excellence in Teaching, Department of Biology, UAB
1993-5 Chairman, Alabama Academy of Science, Biological Sciences Section
1994-5 President, Sigma Xi, UAB Chapter

1994-present Chairman, Graduate Student Research Day, UAB
 1993-present Chairman, Environmental and Applied Aquaculture Institute (North and Central Alabama)
 1995 Recipient of the Emmett B. Carmichael Award for Outstanding Paper in the Journal of the Alabama Academy of Science
 1996 Honorary Member to Golden Key National Honor Society
 1993-1998 Elected to the UAB Faculty Senate
 1998 Nominee for University Award for Excellence in Teaching, Department of Biology, UAB
 1999-present Graduate Program Director, Department of Biology, UAB
 2000 Development of the 5th Year Master of Science in Biology Program
 2002 President, Alabama Academy of Sciences
 2003 UAB Outstanding Faculty Member, Gamma Sigma Alpha National Greek Academic Honor Society
 2003 Inducted as Honorary Distinguished Member, The National Society of Collegiate Scholars
 2004 Who's Who Among American Teachers (nominated and inducted).
 2004 Nominee for President's Award for Excellence in Teaching
 2004 Faculty Advisor, UAB Chapter Alpha Epsilon Delta, Pre-Professional Society
 2005 Outstanding Faculty Member. Recognized by Order of Omega and Gamma Sigma Alpha
 2006 Plenary Lecture, International Echinoderm Conference, 11th Conference.
 2006- Associate Editor, Journal of Experimental Marine Biology and Ecology
 2006 Alpha Omicron Pi Professor of the Month
 2006 Elected to Board of Trustees, Alabama Academy of Sciences
 2006 President's Award for Excellence in Teaching in Natural Sciences and Mathematics
 2007 Caroline P. and Charles W. Ireland Prize for Scholarly Distinction (Highest award for Research Scholarship at UAB)
 2007 Honorary Football Coach for the UAB Blazers (October)
 2009 Dean's Excellence in Mentorship Award (Awarded by the Graduate School for graduate student mentorship)
 2009 Inducted as Fellow of the Alabama Academy of Science
 2010 Stephen A. Watts Research Support Endowment (established by former student in honor of mentorship of Dr. Watts)
 2013 EMSAP Award for Outstanding Faculty (honored by EMSAP students)
 2014 Reviewing Editor, Frontiers in Nutrition

Graduate Student Training:

Graduates:

Carl B. Massey	M.S.	1990. A Characterization of histone proteins isolated from pyloric caeca, testes and sperm of the sea star <i>Asterias vulgaris</i> .
Gene A. Hines	M.S.	1991. Sex steroids in the testes, ovaries and pyloric caeca of the sea star <i>Asterias vulgaris</i> .
Charles D. Bishop	M.S.	1991. Growth of the stomach and intestine of the regular sea urchin <i>Lytechinus variegatus</i> .
Kara J. Lee	M.S.	1992. Developmental regulation of Na ⁺ K ⁺ ATPase activity in the brine shrimp <i>Artemia</i> : The potential regulatory role of polyamines.

Graduate Student Training: (con't)

Mickie L. Powell	M.S.	1993. Electrophoretic identification of several proteins in commercially cultured crayfish species.
Kenneth C. Stuck	Ph.D.	1995. Biochemical responses of postlarval <i>Penaes vannamei</i> to infection by the virus <i>Baculovirus penai</i> .

- Mark E. Meade Ph.D. 1995. Effects of diet and environmental factors on growth, survival, and physiology of juvenile crayfish, *Cherax quadricarinatus*.
- Jennifer L. Kreider M.S. 1995. Behavioral responses of the Louisiana red swamp crayfish *Procambarus clarkii* to natural dietary items and components of formulated crustacean feeds.
- Gene A. Hines Ph.D. 1997. Sex steroids during early development and sex differentiation of the tilapia *Oreochromis niloticus*.
- Charles D. Bishop Ph.D. 1997. The effect of a live diet on organogenesis and functional development of the digestive system in the mouth brooding tilapia *Oreochromis niloticus*.
- Hugh S. Hammer M.S. 1998. Developmental expression of digestive enzymes in *Procambarus clarkii*.
- Kristina M. Wasson Ph.D. 1998. Reproduction and sex steroids in *Lytechinus variegatus* Lamarck.
- Craig Rowell M.S. 1999. Androgen and estrogen metabolism in mono-sex populations of the Nile tilapia *Oreochromis niloticus* during sex differentiation.
- Mickie L. Powell Ph.D. 2000. The effect of temperature and nutrient level on energy metabolism in two sympatric crayfish species.
- Brenda D. Wallace M.S. 2002. The effects of dietary protein concentration on feeding and growth of small *Lytechinus variegatus* (Echinodermata: Echinoidea).
- Scott C. Hofer M.S. 2002. The effect of temperature on feeding and growth characteristics of the sea urchin *Lytechinus variegatus*.
- Suzanne L. Croll M.S. 2002. The effect of temperature on feeding characteristics in two sympatric crayfish species.
- Victoria K. Gibbs M.S. 2005. Temperature affects biochemical composition and cell populations in the gonads of the sea urchin *Lytechinus variegatus*.
- Randall Watts M.S. 2005. Validation of dual-energy x-ray absorptiometry (DXA) to predict body composition of channel catfish, *Ictalurus punctatus*.
- Hugh S. Hammer Ph.D. 2006. Determination of dietary protein, carbohydrate, and lipid requirements for the sea urchin *Lytechinus variegatus* fed semi-purified feeds.
- Anna Morris Taylor M.S. 2006. Effect of dietary carbohydrate on weight gain and gonad production in juvenile sea urchins, *Lytechinus variegatus*.
- Adele Cunningham PhD 2007. The annual reproductive cycle of the sea urchin *Lytechinus variegatus* in the Northern Gulf of Mexico
- Heath Garris MS 2008. Feed comparison for dietary standardization of the sea urchin (*Lytechinus variegatus*) and assessment of parental dietary copper preexposure by embryological and fertilization bioassays.
- Natalie Jennings MS 2008. Acetylcholinesterase in the sea urchin *Lytechinus variegatus*: Characterization of developmental expression in larvae
- Dorothy Moseley MS 2008. Effect of monosodium glutamate on embryological development in the sea urchin
- Kim Trawick MS 2009. The effect of dietary zinc on growth and reproduction in the sea urchin *Lytechinus variegatus*
- Cristina Richardson MS 2010. Factors affecting cannibalism in intensive culture of the sea urchin *Lytechinus variegatus*: effect of size, density, and injury
- Alicia Kindred MS 2010. Effect of caffeine on growth and reproductive development of the sea urchin *Lytechinus variegatus*
- Laura Heflin MS 2010. Effect of dietary protein and carbohydrate on growth and organ production in the sea urchin *Lytechinus variegatus*
- Victoria Gibbs PhD 2011. An evaluation of dietary lipids on growth performance in the sea urchins, *Lytechinus variegatus* (Echinodermata: Echinoidea)

Warren T. Jones	PhD	2011	The effects of supplemental dietary vitamins on weight gain and organ production in the variegated sea urchin, <i>Lytechinus variegatus</i> (Echinodermata: Echinoidea)
Chris Taylor	MS	2013	Effects of light spectra and UV radiation in relation to dietary carotenoids on the sea urchin <i>Lytechinus variegatus</i>
Julie Price	PhD	2013	Plant selection, community structure, ecophysiology, and stormwater mitigation on green roofs in the southeastern US

Doctoral, Research Associates, Research Professors:

Lalitha Saripalli (PD, 1993-4)
Mickie L. Powell (RA, 2002-2006)
Anthony Siccardi (PD, 2006-2009)
Mickie L. Powell (RP, 2006- present)
Latoya Paul (PD 2012- present)

Students Currently in Training:

Laura Wright	PhD	Michael Williams	MS		
Chris Taylor	PhD	Adele Fowler	MS	Kate Kohlenberg	MS
Karen Jensen	MS	Lacey Dennis	MS	Marlee Hayes	MS

High School Students, Teachers, Undergraduate Research, Honor's Research:

In the last 25 years over 85 students and 5 teachers have received research training in the laboratory. Numerous students have won awards at various local, regional, national and international competitions for their efforts.

Sources and Level of Research Support:

Agency: Sigma Xi
Amount: \$200 (1981)
Title: Biochemical Adaptation to Temperature in the Sea Star *Echinaster sp.*

Agency: Sigma Xi
Amount: \$200 (1984)
Title: The Effect of 17B-Estradiol on Growth and Anabolic Synthesis in the Sea Star *Luidia clathrata*

Agency: Sigma Xi
Amount: \$100 (1985)
Title: Carbohydrate Metabolism in the Tube Feet and Pyloric Caeca of *Luidia clathrata*

Agency: NATO
Amount: \$5,500 (1986-88)
Title: Influence of Steroids on Spermatogonial Proliferation. With Drs. C. Walker, P. Voogt and M. Klauser.

Agency: NIH (Biomedical Research Support Grant (2 S07 RR07108-14)
Amount: \$2,795 (1986-1987)
Title: Mechanisms Influencing Spermatogonial Mitotic Divisions. With Dr. Charles Walker.

Agency: NSF (Regulatory Biology) Subcontract from UNH
Amount: \$33,346 (1988-89)
Title: Initiation and Maintenance of Spermatogonial Mitotic Divisions

Agency: UAB Faculty Research Grant

Amount: \$2,000 (1988)

Title: Role of Polyamine Metabolism During Osmoregulation of a Marine Invertebrate

Agency: UAB Faculty Research Grant

Amount: \$2,050 (1989)

Title: Tissue Culture of Marine Invertebrates

Agency: NSF (EPSCoR)

Amount: \$15,000 (1989)

Title: Modes and Energetics of Reproduction and Timing of Gametogenesis and Recruitment of Echinoderms in the Offshore Waters of the Gulf of Mexico. Co-PI with K. Marion, T. Hopkins. PI J. McClintock.

Agency: NSF(EPSCoR)

Amount: \$79,000 (1990-91)

Title: Modes and Energetics of Reproduction and Timing of Gametogenesis and Recruitment of Echinoderms in the Offshore Waters of the Gulf of Mexico. Co-PI with K. Marion, T. Hopkins and J. McClintock.

Agency: UAB Faculty Research Grant

Amount: \$2000 (1990)

Title: Polyamines During Early Development

Agency: NSF (EPSCoR, ROA)

Amount: \$14,500 (1990)

Title: The Role of Polyamines in the Ontogeny of Osmotic and Ionic Regulation in the Brine Shrimp *Artemia*. With Raymond Henry and Christine Sundermann (Auburn University).

Agency: NSF (EPSCoR, ROA)

Amount: \$11,200 (1991)

Title: The Role of Polyamines in the Ontogeny of Osmotic and Ionic Regulation in the Brine Shrimp *Artemia*. With Raymond Henry and Christine Sundermann (Auburn University).

Agency: Mississippi-Alabama Sea Grant

Amount: \$73,241, Sea Grant; \$87,990 State Match; Total \$161,231 (1992-93)

Title: Evaluation of Biochemical Indicators of Growth in Crustaceans. With Shiao Wang, Univ. Southern Mississippi.

Agency: NSF (Research Facilities Office)

Amount: \$506,692 (1991)

Title: Renovation and Modernization of the Marine Science Hall Dauphin Island Sea Lab, Alabama Marine Environmental Sciences Consortium. Associate Investigator (G. Crozier, T.S. Hopkins and S. Jorgensen, PI's at MESC.)

Agency: NSF (EPSCoR)

Amount: \$260,208 (1991-1994)

Title: Chemical Defenses of Larval and Adult Echinoderms from the Gulf of Mexico: Implications for Recruitment- and Trophic-Dynamics in Nearshore Benthic Communities. Co-PI with T. Hopkins, K. Marion, R. Zimmerfaust; J. McClintock PI.

Agency: Mississippi-Alabama Sea Grant

Amount: \$8,000 (1991)

Title: Evaluation of Biochemical Indicators of Growth in Crustaceans. PI with Shiao Wang, Univ. Southern Mississippi

Agency: UAB Faculty Research Grant

Amount: \$1,900 (1992)

Title: The Evaluation of Steroid Metabolism in Hormonally-Enhanced Fish Culture

Agency: Mississippi-Alabama Sea Grant

Amount: \$226,814 (\$98,425 Sea Grant; \$128,389 State Match) 1993-1994

Title: Development of a Method for Controlling the Molt Cycle of the Blue Crab, *Callinectes sapidus*. Co-PI with Douglas Watson and Asim Bej.

Agency: NSF EPSCoR

Amount: \$900 (1993)

Title: Federal Agency Visitation Proposal

Agency: AUTRC

Amount: \$30,000 (1994)

Title: The Use of Poultry Meal and Feather Meal as a Supplemental Protein Source in Crayfish and Finfish Diets.

Agency: American Proteins, Inc.

Amount: \$7,000

Title: The Use of Poultry Meal and Feather Meal as a Supplemental Protein Source in Crayfish and Finfish Diets.

Agency: Gulf Coast Research Laboratory

Amount: \$5,000 1994

Title: Polyamine Analysis of Fish Exposed to Toxicants

Agency: Mississippi-Alabama Sea Grant

Amount: \$6000 (1994)

Title: Development of an Accurate and Simplified Method for Species Identification in Pink (*Peneaus duorarum* and Brown (*P. aztecus*) Shrimp Postlarvae: A Fisheries Management Tool. Consortium Fellowship obtained for Mickie Powell.

Agency: Mississippi-Alabama Sea Grant

Amount: \$6000 (1995, resubmission for second year)

Title: Development of an Accurate and Simplified Method for Species Identification in Pink (*Peneaus duorarum* and Brown (*P. aztecus*) Shrimp Postlarvae: A Fisheries Management Tool. Consortium Fellowship obtained for Mickie Powell.

Agency: Tennessee Valley Authority (TVA)

Amount: \$190,000 (1995-97)

Title: Use of Formulated Diets in Crayfish Culture. PI-Watts, with Co-PI Cynthia Kittler (Gadsden State)

Agency: Mississippi-Alabama Sea Grant

Amount: \$36,996 (continuation) 1995

Title: Development of a Method for Controlling the Molt Cycle of the Blue Crab, *Callinectes sapidus*. Co-PI with Douglas Watson (PI) and Asim Bej (Co-PI).

Agency: Mississippi Alabama Sea Grant

Amount: \$20,000 SG, \$35239 Match (1996)
Title: Development of a method for controlling the molting of blue crabs (*Callinectes sapidus*).
(Watson PI, Luo and Watts - Co-PI)

Agency: Mississippi Alabama Sea Grant
Amount: \$46,715 SG funds, \$39,555 Match, Total \$86,270 (1997)
Title: Development of a method for controlling the molting of blue crabs (*Callinectes sapidus*).
(Watson PI, Luo and Watts - Co-PI)

Agency: Mississippi Alabama Sea Grant
Amount: \$6,486 SG funds, \$9,285 Match, Total \$15,771 (1997)
Title: Assessment of *Lytechinus variegatus* as a fishery and aquaculture candidate in the Gulf of Mexico. (Watts PI; McClintock and Lawrence - Co-PI)

Agency: United States Department of Agriculture
Amount: \$133,352 (1997-98)
Title: Physiological Basis of sex determination in the tilapia *Oreochromis niloticus*. (Wibbels, Co-PI)

Agency: Mississippi Alabama Sea Grant
Amount: \$34,029 SG funds, \$17,548 Match, Total \$51,577 (1998)
Title: Development of a method for controlling the molting of blue crabs (*Callinectes sapidus*).
(Watson PI, Luo and Watts - Co-PI)

Agency: CAWACA RC&D
Amount: \$3000 (2000-01)
Title: Economic Enhancement of Rural Family Farms Through Cage Culture of Tilapia.

Agency: Mississippi Alabama Sea Grant
Amount: Total \$334,802 \$181,978 SG funds, \$152,824 Match (1998-00)
Title: Assessment of sea urchins as fishery and aquaculture candidates in the Gulf of Mexico.
(McClintock and Lawrence - Co-PI)

Agency: Education Foundation, UAB
Amount: \$24,500
Title: Proposal for a 5th Year Masters Program (Watts - PI, Co-PI - Lorden)

Agency: UAB Graduate School
Amount: \$10,000
Title: Proposal for a 5th Year Masters' Program in Biology. S.A. Watts (PI) and J. Lorden, Fall 2002-2005

Agency: CAWACO RC&D
Amount: \$2,600 (2002)
Title: Cage Culture of Tilapia in North-Central Alabama

Agency: National Science Foundation
Amount: \$97,008 (2004-05)
Title: Neuroendocrine control of salinity-mediated carbonic anhydrase expression in the gills of euryhaline crustaceans. (Watts - Co-PI, R. Henry PI, Auburn)

Agency: Mississippi-Alabama Sea Grant
Amount: \$129,756 SG funds, \$83,248 Match, Total \$213,004 (2004-05)

Title: Assessment of the sea urchin *Tripneustes ventricosus* as a candidate for aquaculture in the Gulf of Mexico region.

Agency: Texas Sea Grant

Amount: \$177,276 (2006-07)

Title: Dietary nutrient requirement determination and feed development for sea urchins for biomedical, ecotoxicological and educational models (Watts – Co-PI, A. Lawrence, PI, A&M,)

Agency: Mississippi-Alabama Sea Grant

Amount: \$227,605 (2006-07)

Title: Sea urchins are improved candidates for aquaculture and biomedical/ecotoxicological models. (Watts – PI)

Agency: NOAA National Marine Aquaculture Program

Amount: \$2,660,934 (2007-2011) (\$660K NOAA, \$2 mil industry match)

Title: NOAA Marine Aquaculture Program: Development of a Commercial United States Sea Urchin Aquaculture Facility. (Watts – PI)

Agency: NIH supplemental

Amount: \$44,600 (2009)

Title: Development of a Zebrafish Core Facility at UAB (David Allison PI, Watts Co-I)

Agency: Alabama Water Resources Research Institute

Amount: \$25,000 (2010-2011)

Title: Experimental evaluation of plant selection in limiting stormwater discharge from vegetated roofs (Watts Co-PI with Jason Kirby (CCEE) and Robert Peters (CCEE))

Agency: UAB (Gulf Oil Spill Pilot Grant)

Amount: \$20,000 (2010-2011)

Title: High sensitivity toxicity screening of dispersants and residual oil using molecular biomarkers (M. Powell PI, Watts – Co-PI)

Agency: British Petroleum Research Fund

Amount: \$25,645 (2010-2011)

Title: Chemical Dispersants in the Marine Environment: Harnessing the Fish Acute Phase Response for Rapid and Sensitive Evaluation of Exposure (Watts PI)

Agency: ACLAM

Amount: \$26,800 (2013-2014)

Title: Development of a standardized reference diet for the zebrafish, *Danio rerio* (Watts PI)

Publications:

1. Watts, S.A. and J.M. Lawrence. 1982. Effect of starvation on enzyme activities and nutrient stores in the pyloric caeca of *Echinaster sp.* (Echinodermata: Asteroidea). *Comp. Biochem. Physiol.* 72B, 461-463.
2. Watts, S.A. and J.M. Lawrence. 1982. Activity and kinetic characteristics of triosephosphate isomerase from the pyloric caeca of *Echinaster sp.* (Echinodermata: Asteroidea) exposed to different temperatures. *Comp. Biochem. Physiol.* 73B, 881-885.

3. Watts, S.A., R. Scheibling, A. Marsh and J.B. McClintock. 1982. Effect of temperature and salinity on larval development of sibling species of *Echinaster* (Echinodermata: Asteroidea) and their hybrids. Biol. Bull. 63, 348-354.
4. Watts, S.A., R. Scheibling, A. Marsh and J.B. McClintock. 1983. Induction of aberrant ray numbers in *Echinaster sp.* (Echinodermata: Asteroidea) by high salinity. Fla. Sci. 46, 125-128.
5. Dawes, C., C.P. Chen, J. Jewett-Smith, A. Marsh and S.A. Watts. 1984. Effect of phosphate and ammonia levels on photosynthetic and respiratory responses of the red alga *Gracilaria verrucosa*. Mar. Biol. 78, 325-328.
6. Herrin, D., C. Helling and S.A. Watts. 1985. Relative levels of actin and actin gene sequences in tube feet and pyloric caeca of adult starfish *Luidia clathrata* (Echinodermata). Comp. Biochem. Physiol. 81B, 143-147.
7. Watts, S.A. and J.M. Lawrence. 1985. The effect of feeding and starvation on the level and content of nucleic acids in the pyloric caeca of *Luidia clathrata* (Say). In B.F. Keegan and B. O'Connor (eds.) Echinodermata, Proceedings of the Fifth International Echinoderm Conference, Galway. A.A. Balkema, Rotterdam. 571-576 pp.
8. Marsh, A., S.A. Watts, C. Chen and J.B. McClintock. 1986. The effect of high salinity on development, mortality, and number of *Echinaster spinulosus* (Echinodermata: Asteroidea) at different developmental stages. Comp. Biochem. Physiol. 83A, 229-231.
9. Watts, S.A. and J.M. Lawrence. 1986. Seasonal effects of temperature and salinity on the organismal activity of the sea star *Luidia clathrata* (Say) (Echinodermata: Asteroidea). Mar. Behav. Physiol. 12, 161-169.
10. Lawrence, J.M., T.S. Klinger, J.B. McClintock, S.A. Watts, C.P. Chen, A.G. Marsh and L. Smith. 1986. Allocation of nutrient resources in the regenerating asteroid *Luidia clathrata*. J. Exp. Mar. Biol. Ecol. 102, 47-53.
11. Watts, S.A. and J.M. Lawrence. 1987. The effects of 17 β -estradiol and estrone on intermediary metabolism of the pyloric caeca of the asteroid *Luidia clathrata* (Say) maintained under different nutritional regimes. Devel. Growth Differ. 29, 153-160.
12. Watts, S.A., K. Lee, G. Hines and C.W. Walker. 1987. Determination of polyamines in reproductive and digestive tissues of *Asterias vulgaris* (Echinodermata: Asteroidea). Comp. Biochem. Physiol. 88B, 309-312.
13. Klinger, T.S., S.A. Watts and D. Forcucci. 1988. Effects of short-term feeding and starvation on storage and synthetic capacities of gut tissues of *Lytechinus variegatus* (Lamarck) (Echinodermata: Echinoidea). J. Exp. Mar. Biol. Ecol. 117, 187-195.
14. Saito, N. and S.A. Watts. 1989. Activities of hexosekinase, phosphofructokinase and pyruvate kinase in the body wall, pyloric caeca and tube feet of *Asterias vulgaris* : Evidence of body wall as a major source of glycolytic activity. Comp. Biochem. Physiol. 94B, 263-267.
15. McClintock, J.B., T. Hopkins, S.A. Watts and K. Marion. 1990. The biochemical and energetic composition of somatic body components of echinoderms from the northern Gulf of Mexico. Comp. Biochem. Physiol. 95A, 529-532.

16. Watts, S.A., J. Roy and C.W. Walker. 1990. Ornithine decarboxylase exhibits negative thermal modulation in the sea star *Asterias vulgaris* : Potential regulatory role during temperature-dependent testicular growth. Biol. Bull. 179, 159-162.
17. Watts, S.A. and J.M. Lawrence. 1990. The effect of temperature and salinity interactions on righting, feeding and growth in the sea star *Luidia clathrata* (Say). Mar. Behav. Physiol. 17, 159-165.
18. McClintock, J.B. and S.A. Watts. 1990. The effects of photoperiod on gametogenesis in the tropical sea urchin *Eucidaris tribuloides* (Echinodermata: Echinoidea). J. Exp. Mar. Biol. Ecol. 139, 175-184.
19. Watts, S.A., G. Hines, K. Lee, D. Jaffurs, J. Roy, F. Smith and C.W. Walker. 1990. Seasonal patterns of ornithine decarboxylase activity and levels of polyamines in relation to the cytology of germinal cells during spermatogenesis in the sea star *Asterias vulagaris*. Tissue and Cell. 22, 435-447.
20. Hines, G.A., S.A. Watts, S.A. Sower and C.W. Walker. 1990. Sex steroid extraction from echinoderm tissues. J. Liquid Chromotography, 13, 2489-2498.
21. Watts, S.A. and J.M. Lawrence. 1990. The effect of reproductive state, temperature, and salinity on DNA and RNA levels and activities of metabolic enzymes of the pyloric caeca in the sea star *Luidia clathrata* (Say). Physiol. Zool. 63, 1196-1215.
22. Hopkins, T.S., J.F. Valentine, J.B. McClintock, K. Marion and S.A. Watts. 1991. Community patterns of echinoderms associated with substrate and depth in the northern Gulf of Mexico. In Proceedings of the Seventh International Echinoderm Conference, Atami, Biology of Echinodermata. T. Yanagisawa, I. Yasumasu, C Oguro, N. Suzuke and T. Motokawa (eds.). A.A. Balkema, Rotterdam.
23. Hopkins, T.S. , J.F. Valentine, J.B. McClintock, K. Marion and S.A. Watts. 1991. Echinoderms associated with a rhodolith community on the Alabama outer continental shelf: Management considerations for a unique environmental setting. In: Proceedings: Eleventh Annual Gulf of Mexico Information Transfer Meeting, November, 1990. U.S. Dept. of Interior. Minerals Management Service. New Orleans, LA. MMS Contract No. 14-35-0001-30499. pp. 443-448
24. McClintock, J.B., T.S. Hopkins, S.A. Watts, K. Marion and G. Schinner. 1991. Variation in reproductive patterns in echinoderms from the northern Gulf of Mexico. In: Proceedings: Eleventh Annual Gulf of Mexico Information Transfer Meeting, November, 1990. U.S. Dept. of Interior. Minerals Management Service. New Orleans, LA. MMS Contract No. 14-35-0001-30499. pp. 448-452
25. Hopkins, T.S., Cornett, M.W., McClintock, J.B., K. Marion and S.A. Watts. 1991. Secondary production: Differential arm loss in two sympatric species of sand stars. In: Proceedings: Eleventh Annual Gulf of Mexico Information Transfer Meeting, November, 1990. U.S. Dept. of Interior. Minerals Management Service. New Orleans, LA. MMS Contract No. 14-35-0001-30499. pp. 452-456
26. Hines, G.A., J.B. McClintock and S.A. Watts. 1992. Levels of estradiol and progesterone in male and female *Eucidaris tribuloides* (Echinodermata: Echinoidea) over an annual gametogenic cycle. Florida Scientist 55, 85-91.

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Ala Acad 2013

Patents: Several trade secret applications are currently being disclosed concerning animal feed development.

Entrepreneurial Activities

President and CEO - Aquatic Agriculture, Inc. Consulting, S-Corporation, incorporated 2001. AquaAg was incorporated in 2001 as a S-Corporation. The company serves to consult industries in aquatic food production (aquaculture and hydroponics). Clients include private industries and correctional facilities.