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**PROFESSIONAL EXPERIENCE** *(short version)*

**Dates Organization Position**

Mar/17-Present Self Employed Writer/Research/Present

JAN/2011-Mar/17 Spirit Sustainable Resources Scientist/Shareholder

JAN/2010-JAN/2011 Self Employed Owner

MAY/05-JAN/2010 SeaArk Africa (RSA) Managing Director of R&D

SEP/05-NOV/05 SeaView (AUST) Consultant

SEP/03-JUN/04 Zonda Resources (NZ) Consultant/Prod. Super.

JUL/03-AUG/03 NOVA SE University (USA) Consultant

JUN/03-JULY/03 The Seahorse Farm (NZ) Consultant

MAY/03-JUN/03 Prawn Park (NZ) Consultant

OCT/02-NOV/02 HB Shrimp (FL) USA Consultant

JUL/02-SEP/02 Phycotransgenics (USA) Post Doc. Shrimp Disease

JAN03-MAY/06 Taste of the Ocean (AUS) Consultant

 JAN/02-DEC/03 Indian River Com. College (USA) Teaching: Adjunct Professor Science

JAN/01-JUN/02 Harbor Branch Ocean Inst. (USA) Post Doc. Research: Minimum ions

JUL/00-DEC/00 Auburn University (USA) Post Doc. Research: Shrimp low salinity

JUL/00-SEP/00 Auburn University (USA) Teaching: Fish Nutrition Lab

MAY/99-NOV/99 Auburn University (USA) Research Assoc1: Shrimp Pond Mgmt

**EDUCATION**

**College / University Dept /Major Dates Attended Degree**

Auburn University Aquaculture 6/96-6/00 Ph.D.

Clarion University of Pa. Biology/Biology 6/94-6/98 M.Sc.

Marywood University Biology/Env. Sc. 6/88-6/94 B.Sc.

**AWARDS AND ORGANIZATIONS**

Best Oral Presentation (2nd Place), World Aquaculture Society (US Chapter) meeting 2000, New Orleans, Louisiana

Best Abstract, Best Oral Presentation (2nd Place), World Aquaculture Society (US Chapter) meeting 1999, Tampa, Florida

World Aquaculture Society member since 1994, Aquaculture Engineering Society 2002, International Water Association 2007

**PROFESSIONAL EXPERIENCE** *(long version) & PUBLICATIONS*

*Description of Consultancy, Research, Teaching and/or Related Activities*

1. **SPIRIT SUSTAINABLE RESOURCES (PAN)** (JAN/11-Mar/17)

Scientist/Shareholder

 Develop business plans, build research facility, conduct research, implement pilot project and full scale commercial designs for integrated shrimp aquaculture in Panama.

2) **SELF EMPLOYED (RSA)** (JAN/10-JAN/11)

Director & Chief Executive Scientist

Design fully integrated zero water exchange prawn/shrimp production and separate aquaponics farm systems, produce business plans, developed logistics and planning for international investment opportunities

3) **SEAARK AFRICA (RSA)** (FEB/06-12/09)

Managing Director R & D

Designed from startup, implement, manage and control shrimp production research in minimal exchange tanks and raceways. World records attained for most biomass produced globally.

3) **SEAVIEW (NZ)** (SEP/05-NOV/05)

Consultancy

Install recirculation system for aquarium ornamental fish sales.

4) **Zonda resources (NZ)** (SEP/03-JUN/04)

Consultancy/Production Supervisor:

Solve problems in producing bio-control insects for agriculture

5) **NOVA South eastern University (USA)** (Jul/03-Aug/03)

Consultancy:

Develop production plan for pink shrimp (Farfantepenaeus dourarum) hatchery and research ponds

6) **The Seahorse Farm (NZ)** (Jun/03-Jul/03)

Consultancy:

Develop algae and artemia production plan, advise on general aquaculture issues

7) **Prawn Park (NZ)** (May/03-Jun/03)

Consultancy:

Develop production plan and economic analyses to increase yield on macrobrachium farm

8) **Taste of the Ocean pty ltd (AUS)** (FEB/03-MAY/06)

Consultancy:

Contribute production plans for recirculating system for shrimp (business plan)

9) **HARBOR BRANCH SHRIMP (USA)** OCT/02-Nov/02)

Consultancy:

Define Ion profile requirements and supplement levels for freshwater shrimp recirculating system

10) **PHYCOTRANSGENICS (USA)** (JUL/02-SEP/02)

Research:

Develop a vaccine for white spot virus (WSV), Post Doctorate Fellowship

11) **INDIAN RIVER COMMUNITY COLLEGE (USA)** (JAN/02-DEC/02)

Teaching:

Science Lecture+Lab x 3 - General Biology Lecture and Lab, Life Science Lab

12) **HARBOR BRANCH OCEANOGRAPHIC INSTITUTE (USA)** (JAN/01-JUN/02)

Research:

Minimum ion concentrations for the freshwater culture of L. vannamei (shrimp/prawns)

13) **AUBURN UNIVERSITY (USA)** (JUL/00-DEC/00)

Research:

Low Salinity aquaculture

Post Doctorate Fellowship

14) **AUBURN UNIVERSITY (USA)** (JUL/00-SEP/00)

Teaching:

Fish Nutrition Lab

Post Doctorate Fellowship

15) **AUBURN UNIVERSITY (USA)** (MAY/99-NOV/99)

Research:

Shrimp Pond Management

Research Associate I

**PUBLICATIONS**

**Publications from February 2016 to December, 2018**

**Shrimp Investment in Panama**

https://thefishsite.com/articles/the-many-sides-of-sustainability-in-aquaculture

https://thefishsite.com/articles/how-can-we-save-the-global-shrimp-industry-from-devastating-diseases

http://www.thefishsite.com/fishnews/28218/panama-the-best-opportunity-for-aquaculture-investment/

https://www.undercurrentnews.com/2016/09/23/scientist-panama-ready-for-aquaculture-investment/?utm\_source=Undercurrent+News+Alerts&utm\_campaign=40f04589f9-Americas\_briefing\_Sep\_23\_2016&utm\_medium=email&utm\_term=0\_feb55e2e23-40f04589f9-92440017

http://www.caribbeannewsnow.com/headline-Panama%3A-The-best-opportunity-for-aquaculture-investment-31876.html

**Aquaculture and Nutrition**

http://www.thefishsite.com/articles/2225/mineral-deficiencies-and-aquaculture/

http://www.caribbeannewsnow.com/topstory-Mercury-in-seafood%2C-from-contamination-to-elimination-32082.html

https://www.guyanadailynews.com/articles/2016/10/07/mercury-seafood-contamination-elimination

**GMO**

http://advocate.gaalliance.org/genetically-modified-foods-a-brief-history-of-the-technology/

**The Spiny Lobster (New Species for Aquaculture)**

http://www.thefishsite.com/articles/2215/the-status-of-spiny-lobster-aquaculture-with-emphasis-on-the-potential-of-the-pacific-spiny-lobster-in-panama/

https://www.thevisitorpanama.com/2016/07/panama-lobster-farming/

**The Sea Hare of Panama (New Species for Aquaculture)**

http://advocate.gaalliance.org/the-odd-wedge-sea-hare-is-useful-as-an-algae-cleaner/

http://www.thefishsite.com/articles/2204/sea-hare-one-of-the-fastest-growing-utilitarian-additions-to-clear-water-marine-aquaculture-systems/

**Effects of the El Nino, Harmful Algae and Corals 2015-2017**

<https://sevenseasmedia.org/toxic-algae-blooms/>

https://sevenseasmedia.org/saving-coral-reefs-with-biosecure-zero-water-exchange-aquaculture/

https://thefishsite.com/articles/how-sponges-adapt-to-climate-change

<http://www.caribbeannewsnow.com/headline-The-success-of-coral-sponges-in-Panama-is-due-to-more-than-the-absence-of-El-Nino-34730.html>

https://www.thevisitorpanama.com/2016/08/fish-coral-secas-islands/

http://www.thefishsite.com/articles/2252/surviving-el-nino-corals-at-coiba-island

http://www.newsroompanama.com/travel/panama-2/pearl-islands-underwater-paradise-survives-el-nino

http://www.caribbeannewsnow.com/headline-Toxic-algae-blooms---the-worst-from-the-strongest-El-Nino-ever%3F-29822.html

http://www.ieyenews.com/wordpress/toxic-algae-blooms-the-worst-from-the-strongest-el-nino-ever/

http://www.thefishsite.com/fishnews/27434/toxic-algae-blooms-the-worst-from-the-strongest-el-nio-ever/

http://www.worldfishing.net/news101/industry-news/rising-temperatures-due-to-el-nino-resulting-in-coral-bleaching

http://www.thefishsite.com/articles/2195/rising-sea-water-temperatures-due-to-el-nio-causing-coral-bleaching-in-seca-islands-chiriqui-bay-pacific-panama/

http://www.caribbeannewsnow.com/headline-Rising-sea-water-temperatures-due-to-El-Nino-cause-coral-bleaching-30014.html

https://www.thevisitorpanama.com/2016/06/el-nino-affects-chiriqui-corals/

http://www.thefishsite.com/fishnews/27637/a-closer-look-at-sea-temperature-increase-and-loss-of-1billion-in-farmed-salmon/

**Tilapia**

<https://sevenseasmedia.org/saving-coral-reefs-with-biosecure-zero-water-exchange-aquaculture/>

http://www.caribbeannewsnow.com/headline-Are-tilapia-safe-to-eat%3F-31727.html

http://advocate.gaalliance.org/biofloc-systems-viable-for-tilapia-production/

**New Shrimp Technology**

http://www.massivevybz.com/news/new-technology-for-shrimp-farming-in-panama/

https://thevisitorpanama.com/issues/visitor22-11/index.html

http://ambergriscaye.com/forum/ubbthreads.php/ubb/showflat/topic/69095/gonew/1.html

https://www.undercurrentnews.com/2016/02/10/new-technology-against-ems-tested-in-panama/

http://fishfarminginternational.com/new-technology-aims-to-prevent-ems-outbreak-in-panama/

[http://www.caribbeannewsnow.com/headline-New-technology-for-shrimp-farming-in-Panama-29262.htm](http://www.caribbeannewsnow.com/headline-New-technology-for-shrimp-farming-in-Panama-29262.html)l

http://www.newsroompanama.com/business/panama-4/panama-based-scientist-beats-shrimp-killer-disease-2

http://www.efeedlink.com/contents/02-15-2016/887e0d93-0d51-4521-91f2-680906964ccb-d003.html

http://www.thefishsite.com/fishnews/27415/new-technology-for-shrimp-farming-in-panama/

**Marine Fish**

https://thefishsite.com/articles/blue-by-name-green-by-nature

**Publications from 2001-2004**

 1) McGraw, W.J. and J. Scarpa. 2004.

 Mortality of freshwater-acclimated Litopenaeus vannameiassociated with acclimation rate, habituation period, and ionic challenge.

 *Printed: Aquaculture 236. 285-296.*

 2) McGraw, W.J., D.B. Rouse, D.R. Teichert-Coddington, and C.E. Boyd. 2003.

Effects of maintaining minimum dissolved oxygen concentrations on nitrogen and carbon content in shrimp pond soils.

*Aquacultural Engineering. (accepted)*

 3) McGraw, W.J., D.R. Teichert-Coddington, D.B. Rouse and C.E. Boyd. 2003.

Comparison of shrimp production and water and soil bottom quality in ponds with different

types of aerators.

*Aquacultural Engineering. (accepted)*

 4) McGraw, W.J. and J. Scarpa. 2003.

Minimum environmental potassium for the survival of Litopenaeus vannamei (Boone) in freshwater.

 *Printed: Journal of Shellfish Research. 22. 263-267.*

 5) Laramore, S., J. Scarpa and B. McGraw. 2003.

Concentration de ions requerida para el cultivo de Litopenaeus vannamei en agua dulce.

*Printed: Panorama Acuicola Magazine. 8.2. 60-63.*

 6) Hoagland, R.H. III, Davis, D.A., Nguyen, A.H. and W.J. McGraw. 2003.

Evaluation of practical bluegill diets with varying protein and energy levels.

*Printed: North American Journal of Aquaculture. 65. 2. 147–150.*

 7) McGraw, W.J. 2002.

Utilization of heterotrophic and autotrophic bacteria in aquaculture.

*Printed : Global Aquaculture Advocate. 5.6.82-83.*

 8) McGraw, W.J. 2002

Minimum ions for the culture of marine shrimp in freshwater. Volume 10. pg 18-19.

*Printed : Fish Farming News. 2002.*

 9) McGraw, W.J. and J. Scarpa. 2002.

Marine shrimp (Litopenaeus vannamei) culture in freshwater: determining minimum ion concentrations.

*Printed : Global Aquaculture Advocate. 5.3.36-38.*

10) Davis, D. A., Saoud, I. P., McGraw, W. J., Rouse, D. B., 2002. Considerations for Litopenaeus vannamei reared in inland low salinity waters.

*Printed: Cruz-Suárez, L. E., Ricque-Marie, D., Tapia-Salazar, M., Gaxiola-Cortés, M. G., Simoes, N. (Eds.). Avances en Nutrición Acuícola VI. Memorias del VI Simposium Internacional de Nutrición Acuícola. 3 al 6 de Septiembre del 2002. Cancún, Quintana Roo, México.*

11) McGraw, W.J., D. Allen Davis,D.B. Rouse, and D.R. Teichert-Coddington. 2002.

Acclimation of the Pacific white shrimp to various salinities: influence of age, salinity endpoint and acclimation rate.

*Printed : Journal of the World Aquaculture Society. 33.1.78-84 .*

12) McGraw, W.J., D.R. Teichert-Coddington, D.B. Rouse and C.E. Boyd. 2001.

Higher minimum dissolved oxygen concentrations increase shrimp yields.

*Printed : Aquaculture.199. 311-321.*