

**IN MEMORIAM: GEORGE WILLIAM BENZ (1 JANUARY 1954–9 FEBRUARY 2015)**

“You wonder what the copepods think... if copepods think... I hope they do. I bet they do.  
You didn’t hear me say that... Remember, I’m a scientist!”

*GWB, Aquarium of the Pacific, 17 Feb 2010*

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The fearless pirate Professor George William Benz died from heart complications on the evening of Sunday 9 February 2015 at the age of 61 at his home in Murfreesboro, Tennessee, USA. He was born on New Year’s Day 1954 in New Haven, Connecticut, and grew up and attended schools in nearby Orange. A born skeptic, he joked that his ‘alleged’ birth date all but confirmed he was adopted; believing all adopted kids were given 1 January as their date of birth.

One is lucky to know a person who has a big mind and a big heart. George was that person. For students and colleagues that he trained and collaborated with, George was a big brother, little brother, best friend, father, or combination of those depending on the situation. As demonstrated by his fierce loyalty to, and reverence for, his advisors and mentors, I believe he considered himself as if a son to those who trained him. He loved people and respected love, dedicating much of his life advocating for his students and helping others succeed; swelling with pride for others’ successes. George had a brutal determination for exploring the natural world with his extended scientific family. Throughout his life, he remained focused on doing just that, and it was one hell of a ride for those of us that he touched.

George’s research interests were broad, but he especially loved the siphonostomatoid copepods that infect the skin, gill, and “snouts” of elasmobranchs. He felt lucky to study parasitic copepods. According to George, his admired colleague Zbigniew (“Bobo” or “Bob”) Kabata (1924–2014, Pacific Biological Station, Nanaimo, British Columbia; who George would later refer to as the “*Yoda of Copepodology*”) would often say to George, “*The copepods have been very good to me.*” This resonated with



George, and he repeated Kabata’s words often. George’s relationship with Bob got off to a prickly start. On one of his early copepod manuscripts, George regarded one reviewer as especially unfairly critical. He rebutted with vitriol, only to subsequently discover that the Yoda of Copepodology himself was, in fact, the reviewer. This left George humbled and embarrassed, but grateful and wiser for it. Famously gracious to his colleagues, obviously

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Bob did not let George's misstep prevent a bond between them from growing stronger and stronger over the years. George too was well aware of the magic and privilege associated with being a biologist more broadly: "You can be such a, well... 'slacker,' as a scientist because you get to do things that little kids want to do but you get paid for it. I mean, it's like being Peter Pan." George's early years as a biologist were field-intensive, including inland and marine fisheries arenas. Later, while becoming established as an authority on the taxonomy and biology of siphonostomatoid copepods, he became expert on fish diseases for the public aquarium industry, freshwater aquatic conservation issues in the southeastern United States, and Arctic biology via studies of sleeper sharks (*Somniosis* spp.) and their polar ecosystem. He built a research institute from the ground up, and, although he became a professor late in life, throughout his career he maintained productive professional collaborations with university faculty and their students as well as state and federal aquatic biologists.

A self-taught but classically-minded taxonomist, George and co-authors proposed a new family and 5 genera as well as described 17 new species; among them copepods, pentastomes, monogenoids, and leeches. George always created space and time for introducing students to the methods and philosophies of science. He believed, "everyone deserves an at bat," i.e., a chance to be a productive worker given the appropriate initial training, feedback, and access. He went out of his way to give opportunities to eager students as well as second and third chances to those who stumbled. George was known to be a life coach as much as a scientific mentor. One of George's former MSc students, Eric R. Salmon (Motlow State Community College, Tullahoma, Tennessee), stated that, "George never wore a mask. I always knew he was sincere, and he really cared for his students. He was blunt but fair and gave praise as needed or earned. I could call him at any time to discuss anything going on in my life." Chris Hall (Barry College, Barry, Georgia) reflected back on his experiences with George at annual meetings of the Southeastern Society of Parasitologists, "I remember George seeking ME out to discuss MY graduate project. I felt special and motivated by the attention from someone so obviously highly regarded." In advising students on the dos and don'ts of anything in life, George would often begin by telling a story of how he had done the opposite of the forthcoming advice/recommendation when he was younger but had learned from it. Such lessons would typically end with "Bottom line...[insert wisdom]." George extended this compassion to his colleagues as well, never bashful about offering support or advice and readily available to listen to or help resolve a sticky professional situation.

In addition to publishing 76 peer-reviewed articles, 12 book chapters and proceedings, a book, and numerous book reviews and critical comments (see Appendix A), George was a potent spokesperson for parasitology, aquatic conservation, and marine biology; his investigations being featured on television (*National Geographic Channel*,

*British Broadcasting Channel*, *Discovery Channel*) as well as in print media (*National Geographic*, *Discover*, *Highlights for Children*, *Der Spiegel*). In addition to being a professor and distinguished researcher at Middle Tennessee State University, he was a research associate and adjunct faculty with the National Marine Fisheries Service (Narragansett, Rhode Island), Mote Marine Laboratory (Sarasota, Florida), Tennessee Aquarium (Chattanooga, Tennessee), Warnell School of Forest Resources (University of Georgia, Athens, Georgia), and School of Fisheries, Aquaculture, and Aquatic Sciences (Auburn University, Auburn, Alabama). He chaired 7 graduate committees and served as a committee member for numerous other graduate students at MTSU, University of Connecticut, University of Georgia, Saint Mary's University, University of Tennessee Chattanooga, and University of Windsor. He was a long-time member of the Southeastern Society of Parasitologists (President 2000; Vice President 1997), American Society of Parasitologists, American Fisheries Society, American Elasmobranch Society, and World Association of Copepodologists. He was an editor for the *Journal of Parasitology* (2000–2009) and *Acta Ichthyologica et Piscatoria* (2003–2015) as well as provided expert ad hoc reviews for 28 journals covering parasitology, ichthyology, marine biology, and aquatic sciences. George's ad hoc reviews could be as long or longer than the manuscript being reviewed. He also refereed for the National Science Foundation, Natural Sciences and Engineering Research Council (Canada), National Geographic Society, US Geological Survey, and Smithsonian Institution. Two parasites are named in his honor: the copepod *Kroeyerina benzororum* Deets, 1987 and the blood fluke *Selachohemecus benzi* Bullard et Overstreet, 2006. The 2015 meeting of the Southeastern Society of Parasitologists (Blacksburg, Virginia) was held in his honor, and Izawa (2015) is dedicated to his memory.

George said that his two best life decisions were marrying Judi ("Jude" to George) and studying parasitic copepods. They were married in 1974 and, as newlyweds, could be observed at shark fishing tournaments in Long Island or Rhode Island, sleeping in their car or dissecting sharks dockside in pursuit of parasitic copepods. Those of us who knew George are lucky to also know Judi: a professional woman of superhuman work ethic, patience, warm kindness, adaptability, and, not to mention, physical strength. Needing a spotting partner for weight lifting, George (who had been body building since high school) encouraged Judi to also enter the sport. Judi exceeded George's successes in the arena and went on to be a champion body builder throughout the 1980's. She won back-to-back Ms. Universe- Light Heavyweight Division titles in 1987 and 1988 plus 18 national and regional titles. In 1988, George and Judi won 2nd place in the "AAU Couples America Open Class." George often referred to Judi as his "rock," and she counterbalanced George such that his various idiosyncrasies and adventures in life never became pathological. As George tended to climb higher and higher up the mast to see farther and farther on the horizon, Judi was the keel and ballast that

kept the boat righted in any weather. She supported him during his undergraduate and graduate programs, assisted him in the field on collection trips domestically and abroad, co-hosted all of the various raucous late-night parties at the Benz Home (cleaning up the mess and preventing emergency room visits pertaining to explosives and firearms), listened to all the stories, and shared George's personal stake in his mentees and students. She was there for everything significant that happened in George's life; Judi was his support system. Martin L. Adamson (University of British Columbia [UBC], Vancouver; George's PhD advisor) commented that, "*They made an exquisite team. Judi, like George, was street smart... but, on top of that, she was George smart. She knew all of his corners (as he knew hers), and it was always fun to hear her tell a story from her point of view or to hear her react to George while he told his version of the story.*"

George was a barrel-chested man with a big personality and a joyfulness in experiencing people; fitting the description of one who is larger than life. He had diverse interests and talents, pursuing none of them half-heartedly. He loved the family cats, always having two or three in the house; considering the cat to be "*the thinking man's dog.*" He loved cooking, eating, and sharing food with company, and he especially enjoyed the story-telling and discussions that would ensue during and after a meal. George had an ever expanding garden, and each season's yields were incorporated into experimental dishes or shared with whomever was around. Being in the kitchen with George and making dinner with him was a time for great conversation. Most who knew him have had many talks that went on until the early hours of the morning, usually over a large quantity of fire-cooked leg of lamb (or other meat), beer or a good single malt, and a fine cigar afterwards. Some good ideas came from those late-night talks but not all of George's cooking exploits turned out as well. Everyone who was there agreed that haggis (a pudding of sheep lungs, liver, heart, and, in George's recipe, other things) probably went too far, or at least required underappreciated experience to prepare properly. After another party George reported that, "*The sauerkraut cream pie was very interesting but not good. It was a very strange mix of things, all of which one could taste at the same time. Strange, as the brain says, 'what are all of these things doing in my mouth all at once?'*" One of George's undergraduate researchers, Bailey C. McMeans (now University of Toronto Mississauga, Toronto), reported another memorable and exciting culinary fail resulting from giant Chinese fighting water beetles, which George purchased from his favorite Asian food market in Nashville. Because "*everything is good fried,*" George did just that with the beetles but subsequently rejected the aforementioned hypothesis upon spitting out the fried insects. But that was George: experiencing new combinations of tastes as he blended science disciplines, perspectives, and friends.

George loved the ocean, spending his formative years as a biologist near the shore and regularly returning to the ocean throughout his life to collect parasitic copepods

whenever possible. Whether from a beach, pier, or flying bridge; looking out at the ocean, George would take a deep breath, close his eyes, and drop his shoulders before serenely exhaling with the satisfaction of simply being there, on the water. His music interests were eclectic, having a fascination with a particular artist for a while before moving on to another style or artist, for example, Zamfir ("King of the Pan Flute"), Nusrat Fateh Ali Khan (Qawwali singer), Iggy Pop, Tom Waits, or Unknown Hinson. George continued weight lifting during the '70s and '80s but never reached Judi's level of achievement in the sport: "*Jude was the best at it, I just did it to see how big I could get.*" Reflecting George's propensity for collections and collecting things, his home office (aka 'The Inner Sanctum') comprised two large rooms upstairs that were wall-to-wall books (key references and rare volumes), primary literature, specimens, cameras, and microscopes. A visit to the Benz Home usually began with a big hug from Judi, a "*long time no see!*" from George, then a beer in-hand for a high-energy tour of the home office, showcasing all of the new additions to the library, microscopy arsenal, and specimen collection.

A romantic, George was captivated by old tomes, science history, and the lives of scientists who preceded him. Finger stabbing a page of lithographed illustrations in an early 19<sup>th</sup> century taxonomic monograph, George would say, "(as taxonomists) *we should at least be as good as THIS!*" He was intrigued by the ichthyologist David Starr Jordan, and George proudly displayed a copy of Starr's two-volume "The Days of a Man" in his home office. He shared that same romanticism about pirates, his laboratory adorned with skull and bones flags as well as quotes attributed to various pirates, among other such oddities. He would often advise "*Be a pirate*" in the context of prioritizing your time for things that matter: 'be a pirate' who steals time for yourself and for those you desire to help, rather than wasting time on trivial bureaucracy and nonsense. As any good pirate should be, George was proud of his tattoos. He had several: shortfin mako shark on right shoulder (1988), tiger shark on left forearm (2005), swordfish on right forearm (2006), shortfin mako shark on right inner forearm (2010), and 'skull and marlins crossbones' on left upper arm (2013). He had a special friendship with tattoo artist Steve "Inker" Gabriel (aka "The Ink"; Guideline Tattoos, East Hartford, Connecticut), who would close his shop and tattoo George whenever he and Judi materialized at his storefront. Rounding out the tattoos, George often wore two large skull rings similar to those famously worn by Rolling Stones guitarist Keith Richards. Nothing says 'f-you' like a skull ring, and George wore one on each middle finger; enjoying the muted reactions such jewelry would inspire in various professional settings: "*These skull rings draw some odd looks. It's fun.*" George, of course, rode motorcycles since his youth; he was the sort of rider that naturally looked as though he belonged on a bike. His life relating to motorcycles and those who identify with them is beyond the purview of the present work, but it should be noted that George was more than a recreational rider for a brief span of his young adult life before entering graduate school.

Although he never touted himself as an artist, George's illustrations of siphonostomatoid copepods demonstrated his talent for art that naturally fueled his compulsion for describing animals. His drawings of parasitic copepods are among the best yet published, yet he constantly tried to outdo himself with each forthcoming taxonomic description; spending many hours painstakingly stippling copepod appendages. It was not uncommon for him to redo plates if they were not quite up to snuff or to politely redraw a coauthor's illustrations before submission. It is not an easy thing to draw a copepod: each appendage excised from the body of the copepod, stained, mounted, and drawn; literally hanging in the balance (as per the 'hanging drop method' of Humes and Gooding). His drawings are indeed aesthetically pleasing but they are made all the more beautiful in knowing the level of technical skill and dexterity involved with manipulating the microscopic appendages such that they can be artistically rendered. Ironic that a person of George's physicality was an expert manipulator of minute invertebrate appendages.

George was always thinking of creative ways to make the presentation of science more artistic, e.g., Figure 6 of Benz and Deets (1988) depicts a phylogenetic tree as a kelp, the kelp's bladders indicating character states and each frond comprising terminal nodes elegantly pointing to the illustrated copepod-host combination. George's dissertation also featured a 'kelp phylogeny' of the Siphonostomatoidea. Of course his favorite holiday was Halloween, and he loved getting into costume. Each October brings "*Ghouls at Grassmere*," a big, outdoor Halloween costume party at the nearby Nashville Zoo, where Judi worked. George loved the Fall in general but especially the 'Ghouls' event. Always the rebel/innovator, George used graduation ceremonies at his home institution as a chance to extend its pageantry in costume: developing his regalia into a Harry Potter-esque menagerie of squirrel and mink skins, dangling plastic skeletons affixed to a cincture, plus a wand-like wooden cane.

Socially and politically, George was both a ringleader and a rebel. He had that sort of charisma that attracted people and brought people together around him, and he was usually at the center of whatever group and routinely influenced the group's actions and words. He typically said 'what needed saying' and stabbed and shouted at the elephant in the room. He also had a way of 'gluing people together' who normally would never associate. From the outside this could sometimes appear as a social experiment or reality TV show but usually just felt good to be part of a group that included George. His bravery and fearlessness in challenging established persons, authorities, and views was commendable, although not always politically tactful or popular; even among his close friends or colleagues. And, in some instances, causing him intense, prolonged anxiety. He simply was incapable of 'going along to get along.' George had some interesting views on tenure and promotion in that regard: believing that tenure should be done away with because tenure and promotion decisions were seemingly increasingly dependent upon

the candidate's political cunning rather than intellect and scholarly achievement.

I believe that many of us who knew George feel the following way and have similar stories about how he affected our lives. George was my friend for a long time; I regarded him as family; and I owe him a lot regarding my professional development and survival. I met him in 1993, when I was a freshman undergraduate student at the University of South Carolina (Columbia), returning to my hometown of Chattanooga, Tennessee, and looking for summer work at the newly-opened Tennessee Aquarium. When I reported for my interview with the personnel office, the choice was working in janitorial services or volunteering to intern with "*the scientist-type guy that studies bugs on sharks*." Shortly thereafter, I was escorted through the lobby and various exhibits, into a service elevator, up a flight of stairs to the upper level of the aquarium, nestled beneath the glass-covered aviary on the highest level of the complex overlooking the Tennessee River and downtown Chattanooga, and finally down a corridor and into an office. And there was George: the tattooed, pony-tailed '*scientist-type guy*,' who seemed to fill the tiny office. We talked for a long time, discussing religion, science, fishing, the water, and childhood. George had a way of leaning into conversations, leaning forward and taking purchase of the table or desk in front of him, his elbows on the table, his back like a sort of crane- straight as a board but projecting over the table, his eyes fixed on you as he listened, and his hands alternating between gestures, beard, beer, and spectacles. He always had questions that extended understanding and proved he was 'with you' in the conversation. He would say, "*Well, based on what you just said, riddle me this...*," and it was typically a synthesis, a new take, a wonderful question. He was a terrific foil for trying out ideas and hypotheses, usually encouraging exploration of the radical perspective first. I never observed him any other way in discussion with any colleague or student. In his office that day in 1993, I remember feeling a profoundly personal connection with George in that moment, sensing that he could see the best in me and understood its potential, even if I did not. When we had finished talking, I had made a new friend that I would follow into a burning building. In the 22 years that I knew George, I observed that George had this same acute effect on many of the people he met in his life, each feeling a profoundly, deeply personal connection with him in the same way that I did; and soon after they had met him. He had that power, and it allowed him to help a lot of people as advisor, colleague, or friend. For some, all it took was a conversation at a meeting or a few beers at a bar at some conference somewhere. Some felt that connection with George without ever having met him but having only corresponded by email or by phone.

A common thread in George's career was his courage and confidence to work in a diversity of new systems and fields. He routinely pursued new lines of investigation without any hesitation or self-doubt, became expert and productive, and communicated his excitement and discoveries to his colleagues and students. Yet, he was

humble and knew that he needed help. So, along the way he sought out good people to learn from, work with, and explore the world with. He was exceptionally adept at absorbing knowledge from those he interacted with. “*Be a sponge*” he would say, encouraging his students to follow his example and learn as much as possible from as many as possible; regardless of their age, status, or occupation. He kept those people close and regarded them as friends throughout his life, and he did much the same with students he trained. “*Find good people and keep them close.*” Fiercely loyal to his friends and students, George was the mental and physical presence you wanted behind you in a faculty meeting or bar fight. George had a way of understanding the essence of a person or a situation quickly and accurately, indeed a strain of ‘street smarts’ seemingly rare among academics. He also had the ability to stab you in the heart with words and expressions, cutting to the core of the meaning of things to get at the truth, eviscerating rhetoric and wiping away any trace of ‘bullshit.’ No interaction with him was half-measure or fake; no idea softened or presented in coded language.

In 1972, 18-year-old George enrolled as an undergraduate biology student at the University of Connecticut (Storrs). He first gained exposure to parasitology in the classroom and laboratory of Lawrence Raymond (“Larry”) Penner (1913–1985; Professor of Parasitology, University of Connecticut, Storrs [UConn]). Larry was George’s first parasitological mentor and had a big influence on him as a young scientist. Even after graduating with his BSc, George continued to interact extensively with him; using his laboratory as a home base to support his studies of parasitic copepods later in his life. Clearly a kindred spirit with George, Larry’s flat gravestone is defiantly inscribed, “*students may sit here.*” As the cemetery is across the street from the Biology building at UConn, Larry was known to be upset by the fact that complaints were lodged against UConn students and other young people who used the cemetery as a hangout for sunbathing, playing, and studying. George often told this story to his students. Soon after Larry died in 1985, George named *Dermophthirius penneri* Benz, 1987, an ectoparasitic monogenoid that infects the skin of blacktip sharks, to honor his “*good friend and advisor*” (Benz 1987). While he was an undergraduate student in Larry’s laboratory, George began attending ‘big game’ fishing tournaments along the New England coast in Long Island as well as Rhode Island (Bay Shore Tuna Club, Hudson Anglers, and Montauk Marine Basin [see Benz 1984a, 1984b]). By sampling sharks at these tournaments, he began to amass a diverse collection of parasites, which he worked up in Larry’s laboratory. George already had begun teaching himself about parasitic copepods, a taxonomically intimidating group.

In 1976, George graduated with his BSc from UConn. As an undergraduate, George had already met Walter (“Wally”) R. Whitworth (Professor of Fisheries, UConn), who, perhaps along with Larry, recognized George’s enthusiasm for biology. Together, perhaps they encouraged George to enroll in a graduate degree program. That same

year, George began a MSc program at UConn in Renewable Natural Resource Conservation under Wally but, utilizing Larry’s laboratory, continued studying miscellaneous fish parasites as well as the rapidly accumulating multitude of shark tournament-derived parasitic copepods. Soon thereafter in 1977, 23-year old George attended the Southern New England chapter meeting of the American Fisheries Society (Danvers, Massachusetts). There, he introduced himself to Harold L. (“Wes”) Pratt, Jr., who was stationed at the Northeast Fisheries Science Center, National Marine Fisheries Service (NMFS; Narragansett, Rhode Island). Wes was a rising star in the relatively new field of elasmobranch reproductive physiology, and immediately introduced George to his boss John G. (“Jack”) Casey, who was also in attendance. Jack founded and managed the NMFS Cooperative Shark Tagging Program, which was a component of the Apex Predators Program that he founded fifteen years earlier, in 1962. Wes recalled his first interaction with George at their 1977 meeting: “*After my talk, this massive young guy in a muscle shirt, very out of place among the state fisheries guys, came up to me and started asking technical questions. I still remember being struck by George’s deep, tough-guy Bronx-sounding accent as he asked me to contrast my findings on sexual dimorphism with those from a recent publication on batoid dentition. He was mind-blowing.*” As George and Judi were routinely attending and collecting parasites from shark fishing tournaments, George began to regularly cross paths with Wes, Jack, and other NMFS personnel who were likewise using the tournaments to collect vital data on landed sharks. George often said that meeting Wes, Jack, and the other NMFS “troops” was a critical event in his life cycle as a biologist. At that time, this group included, among others, Francis G. “Frank” Carey (1931–1994; Woods Hole Oceanographic Institution; “Father of Tuna Biology,” a legendary marine physiologist and ichthyologist who discovered tuna and shark endothermy and even built his own acoustic tags, among other pioneering achievements [Carey and Teal 1966]), Wes, Charles “Chuck” Stillwell, and Nancy E. Kohler as well as, later, Gregory (“Greg”) B. Skomal and Lisa J. Natanson. As a PhD student, George would later name the parasitic copepod *Kroyeria caseyi* Benz et Deets, 1986 in honor of “*good friend and shark expert*” Jack, who ultimately came to serve on George’s MSc committee at UConn.

In 1978, Jack furnished 24-year-old George with the opportunity of a lifetime: going to sea with the NMFS troops to longline for swordfish and sharks in the northwestern Atlantic Ocean aboard the cooperating Polish fishing vessel F/V *Wieczno*. As a proper pirate, George loved going to sea. He needed to be at sea, perhaps being afflicted with that particular disease that makes you forever wish you lived on a boat or near the shore. Later in his career, he would continue to go to sea whenever possible as well as push his students to do the same; providing the contacts for them to experience what he had when he was younger. George often recalled a deep sense of camaraderie and mutual respect among the biologists and Polish fishermen aboard F/V *Wieczno*. According

to first-hand observer Wes, George thrived aboard F/V *Wieczno* as a young scientist interested in all aspects of shark biology and the frontiers of parasitism, but also as a comrade who connected with the ship's fishermen, bridge crew, captain, and steward. Remaining true to his inner prankster, George was the ringleader of a playful protest against the compulsory (and trivial) emergency drill aboard F/V *Wieczno*: fashioning hats made from cut-up orange fishing buoys to substitute for the brimmed hat required for drill and distributing them to the science crew. George was also known to prank call the Narragansett laboratory, calling his friends there as a fictional character he invented named "Mr. Blevins," who would ask for information on where to deliver the massive, putrefying basking shark that he was hauling in the bed of his pick-up truck. According to Wes, in the days before caller ID, many in Narragansett were weary of a call from "Mr. Blevins."

In 1979, George graduated with his MSc degree from UConn, with committee members Wally (chair), Jack, Alan H. Brush, and Sanford A. Moss. The samples for his resulting thesis ("*An electrophoretic investigation of the soluble nuclear eye lens proteins of the sandbar shark [Carcharhinus milberti] as a potential means of stock identification*") were sourced from New England shark fishing tournaments (Bay Shore Tuna Club, Freeport Tuna Club, Great Gun Anglers, Hudson Anglers) as well as the 1978 F/V *Wieczno* cruise. Cruises aboard the NOAA R/V *Delaware II* occurred thereafter, and George's parasite collections from these cruises resulted in several published papers on parasitic copepods of sharks. The bench work for these published papers occurred in Larry's laboratory at UConn.

After completing his MSc degree, in 1980, for a short time George worked in the laboratory of Dr. Eugenie "Genie" Clark (aka "The Shark Lady," 1922–2015; Department of Zoology, University of Maryland, College Park). Interestingly, Genie and George's first parasitological mentor, Larry, crossed paths years before at the Cape Haze Marine Laboratory in Placida, Florida. The laboratory was founded by Genie in 1955 but was moved to Sarasota and then renamed "Mote Marine Laboratory" in 1967. As a UConn professor of Parasitology, Larry summered with his family in the Cape Haze-Placida area, using the time to collect parasites from fishes and birds as well as multitude of various shells from beach and estuarine sites along the south Florida Gulf coast. Larry met and worked with Genie there (Benz 1987), and perhaps this connection facilitated George working with Larry's long-time friend Genie in 1980. George was proud of his and Larry's connection with Genie, holding her in high esteem and remaining her friend for the rest of his life. This put George within a prestigious academic lineage: one that traces back ultimately to George Cuvier (1769–1832) via Genie's PhD advisor Carl Leavitt Hubbs (1894–1979), Hubbs' advisor David Starr Jordan (1851–1931), and Jordan's advisor Louis Agassiz (1807–1873), who was Cuvier's student. George's first scholarly works were submitted from Genie's laboratory, including pathology of eudactylid infections in shortfin makos

(Benz 1980a), his MSc thesis (Benz 1980b), *Philometra* infections (see Benz and Pohley 1980), and copepod functional morphology and site specificity (Benz 1981).

Later that year, in 1980, George moved back to Connecticut to take a job as a fisheries biologist with the Connecticut Department of the Environment's Fisheries Bureau. As a fisheries biologist, George worked extensively with stock assessment of largemouth bass (*Micropterus salmoides*), ultimately publishing a novel method for field-sexing bass (Benz and Jacobs 1986) still used today in inland fisheries biology. While fulfilling his obligations at the Fisheries Bureau, George moonlighted as a parasitologist, gathering data on copepod spatial distributions in gill and olfactory lamellae (Benz 1984a, 1986) as well as barnacles attached to copepods (Benz 1984b). George's ongoing obsession with parasitic copepods during this period in his life was making it impossible to not dive into a PhD program.

In early Summer 1984, George and Judi were competing in the Mr. and Mrs. America body-building competition in Pasadena, California. About 30 miles south of there, Gregory ("Greg") B. Deets, a professional body surfer, was surfing "The Wedge" off Newport Beach. Greg had corresponded by mail with George previously after the two had become aware of each others' published works treating siphonostomatoid copepods but from opposite sides of the country. At that time, Greg was finishing up a MSc with Ju-shey "Kai" Ho at California State University, Long Beach. They planned a meeting after the competition, and Greg gave up a day of surfing to meet George and Judi in Pasadena to show them around the area as well as to introduce George to Kai. They met at a pre-determined street corner, and, after locating George and Judi (who stood out in a crowd), Greg rolled down the window of his car and said the secret password, "Siphonostomatoida," which led to immediate laughter that kicked off the whirlwind tour of the coast from Newport to Laguna Beach, including Balboa Park and the San Diego Zoo. The trio became fast friends. George and Greg immediately began planning the next phase of life in pursuit of copepods: moving to the University of British Columbia (UBC) in Vancouver to work with Daniel ("Dan") R. Brooks, who at that time had recently just arrived to UBC and whose interests in cladistic analyses and parasitology were a good fit. George's years of working at the Fisheries Bureau were fast coming to a close.

Soon thereafter, George attended the 2<sup>nd</sup> International Conference on Copepoda (ICOC) held in Ottawa, Canada, on 13–17 August 1984. He presented his paper entitled, "*Distributions of siphonostomatoid copepods parasitic upon large pelagic sharks in the western North Atlantic.*" There, George had the incredible good fortune of meeting and interacting with several gods of copepodology: Bob Kabata, Arthur Grover Humes (1916–1999, Boston University, Woods Hole Oceanographic Institution), and Roger Frank Cressey (1931–2001, National Museum of Natural History, Smithsonian Institution, Washington, DC; student of Humes) as well as then rising stars (now

established authorities on copepods) Kai (also a student of Humes), Kazuya Nagasawa (Hiroshima University, Hiroshima, Japan), and Geoff A. Boxshall (Natural History Museum, London, England). Geoff recalled from George's 1984 ICOC presentation that, "*He presented a paper on copepods parasitic on sharks and cut a memorable figure – this incredibly well muscled figure presenting on stage. One of his photos showed him with his arm outstretched, holding a shark by the tail. You kind of felt sorry for the shark! I remember being extremely impressed by the quality of his line drawings: they were detailed, accurate and beautiful. Clearly this powerful man was prepared to devote real time to creating such amazing images.*" George and Greg would become roommates, labmates, best friends, and collaborators in copepodology as PhD students at UBC. The two were inseparable, and George took Greg for the brother he never had. Greg's etymology for *K. benzorum* states, "*This species is named for George and Judi Benz, for feeding me and for tolerating me as a roommate...*" and his PhD dissertation stated, "*I must thank George Benz for so many hilarious memories that will never be forgotten, and who kept me going during some of the most testing and strenuous times in my life. His assistance on our coauthorships, his critical eye, insight, and incredible potential for being such an S.O.B is deeply appreciated.*"

George (along with Greg) began a PhD program at UBC with Dan in the Fall of 1985, focusing on taxonomy and host-parasite relationships of siphonostomatoid copepods. His PhD committee included Dan, Martin Adamson, Bob Kabata, Al "Big Al" Lewis, and Geoffrey E. Scudder. That same year, Dan, George, and Greg embarked together on an expedition to the Sea of Cortez to collect parasitic copepods from sharks and rays. Greg recalled staying up all night with George picking copepods from gills and noses of sharks in the Baja desert, all the while blasting "Dog Food" by Iggy Pop. Over a decade later, George and Martin would return to again sample elasmobranch copepods of that area with Janine N. Caira (University of Connecticut, who George called, "*Queen of the Pirates*") as part of a collaborative National Science Foundation grant in 1993. Janine had been hired at UConn in 1986 to fill Larry Penner's position. Martin arrived to UBC in 1985, the same year as George and Greg, and they soon crossed paths during a graduate student discussion group led by Dan. George and Greg clicked with Martin and soon began a durable friendship and research collaboration with him and his students. After Dan relocated to the University of Toronto, Martin eventually took over as George's (and Greg's) committee chair. Martin had a strong influence on George, hosting him in his laboratory at UBC from that point forward and co-authoring some work on parasitic nematodes of sharks (Adamson et al. 1987). Also during this time, George and Greg were interacting routinely with Bob, who was thrilled about their interests in copepod taxonomy. Martin recalled, "*I remember how much Bob Kabata loved them; I cannot overstate the degree to which he appreciated them.*" During this time George and Greg flourished as

scholars of parasitic copepods as well as miscellaneous other groups of parasites that captured their interests, and 31-year-old George was also collaborating with Geoff Boxshall, William E. Hogans (Huntsman Marine Science Centre, New Brunswick, Canada), and Kunihiko Izawa (Izawa Marine Biological Laboratory, Mie, Japan). His publications from this period, many co-authored with Greg, treated parasitic copepod taxonomy (Benz and Deets 1986, 1987b, 1988, Deets and Benz 1986, 1987, 1988, Benz and Izawa 1990, Benz 1991a, Hogans and Benz 1990), life history (Benz and Dupre 1987, Benz 1989, 1991b, 1992, Benz et al. 1992), and pathobiology (Benz and Adamson 1990) as well as parasitic nematodes (Adamson et al. 1987, Benz et al. 1987) and flatworms (Benz 1987). These publications were derived from materials collected in New England big game fishing tournaments, NMFS research cruises in the Northwestern Atlantic Ocean, and collections in the Pacific Ocean and Sea of Cortez sponsored by Dan and in collaboration with Greg and others.

Nearing the end of his PhD program, George had published or submitted approximately 20 manuscripts since arriving at UBC. Rather than stitching together an assortment of those for his dissertation, George elected to delve into a phylogenetic analysis of Siphonostomatoida. This work was based largely on newly-collected specimens, which resulted in a synthesis of information drawn from all accepted families. At his doctoral dissertation defense, as told by Martin, "*George was given explicit, proscriptive direction for his talk: 25 minutes maximum, with no questions. He began his talk by saying that he was going to speak from his heart about the group that he loved and welcomed questions at any time (breaking rule #2). After 25 minutes the Chair stopped him and said he should finish up...it was time for questions from the panel. I believe George acted as though he would comply, but at 30 minutes in it was clear he was not (breaking rule #1). Bob Kabata spoke up explaining to the chair that we were all asking him questions as it was, and that he personally preferred this format, which was actually more challenging for George, and so the Chair gave up. The talk continued for at least 90 minutes before George finished and asked for final questions.*" A self proclaimed, "*horrific big mouth,*" George never had trouble packing a lot of information into a lecture. He loved to teach people about animals, and throughout his career it seemed apparent that he had little care for time limitations or rules of presentation.

In 1991, George and Judi both accepted positions at the Tennessee Aquarium (Chattanooga, Tennessee; hereafter "aquarium"), which at that time was the largest freshwater aquarium in the world. It was unique in that it focused on freshwater aquatic species, including underappreciated freshwater stream fishes and endemic, charismatic aquatic invertebrates like crayfishes, freshwater mussels, and snails. This emphasis on biodiversity and ecology of freshwater aquatic resources of the Southeastern US would later guide George to start-up a research institute as an extension of the aquarium's mission. Aquarium construction began in

1988, and the facility opened on 1 May 1992. Judi was hired to manage retail ticket sales personnel, overseeing about 200 employees. George was hired to oversee setting up the exhibits, equipping the husbandry and water quality laboratories, and advising on aquatic animal health and quarantine procedures. This was an especially exciting time for George and Judi. They purchased a spacious house in ‘the country,’ a few miles from Chattanooga in McDonald, Tennessee. Their property comprised a 10-acre wooded lot; great for hosting the many parties for visiting academic colleagues, students, and co-workers. Parties at the Benz Home usually involved excesses in the categories of food, story-telling and philosophy, alcohol, fire, and explosives. A July 4th party with several dozen attendees ran for over 48 hours, including the overnight, in-ground baking time of a whole pig, a fireworks “show,” a five-course dinner, deserts, and a bonfire.

In 1993, George was a co-investigator with Janine Caira on a National Science Foundation project that targeted elasmobranch parasites of the Sea of Cortez. Janine led two expeditions to Baja: July–September 1993 and May–July 1996. George and Judi both went on the first expedition for a few weeks (also with Martin), sampling around La Paz and Cabo San Lucas. In 1996, George again was beckoned to join the expedition team. This time Janine overnight-mailed his set of paper plane tickets wrapped in a pirate flag (Judi was also invited but could not take off of work). On short notice and without any other communication, and in the days before cell phones (!), George materialized at the airport and was delivered to the beaches of La Paz to join the expedition team. The resulting multitude of parasite specimens and several large plastic drums filled with fixed elasmobranch gills and noses formed the basis of several research topics and subsequent publications for George’s Tennessee Aquarium research interns (Benz et al. 2000, Bullard and Overstreet 2000, Braswell et al. 2002, Bullard et al. 2004a).

George earned his PhD from UBC in 1994 and was promoted to Chief Research Scientist at the aquarium; a position created specifically for him. He would remain in this role until 2003, upon shifting to a tenure track position at Middle Tennessee State University (Murfreesboro, Tennessee). The public aquarium and zoo industry furnished George with a steady stream of curiosities. The acrylic walls (= aquaria) of a modern public aquarium comprise a living aquatic ecosystem replete with all manner of infectious disease ‘problems.’ George relished in the opportunity to walk through the building to get to his office and laboratory each day. What an ideal place for a curious character like George to wind up! Although he was somewhat remiss about having an inland station and not being close to the shore, George was obviously enamored with the idea of a public biodiversity exhibition as well as being the person behind the scene who knew the details of the various things and how they all worked. In specific to parasitology and diseases of fishes, the aquarium industry was a well-spring of interesting host-parasite combinations and scenarios. It furnished a

multitude of “what is this?” queries and parasite specimens from institutions exhibiting animals across the US and abroad. George and I later came to share such diagnostics (taxonomic) cases, with George handling the arthropods and leeches and me taking the helminths. Remarkable how many truly exciting parasitological discoveries can source from these cases, and George was consistently curious and joyful about having the opportunity to see these materials funneled to him (Bullard et al. 2000, 2001, 2012, Kik et al. 2011). Sharks are a mainstay attraction for the public aquarium industry but some of their ectoparasites are serious pathogens in confinement. As such, George’s years of experience in collecting, identifying, and studying the biology of shark parasites served him well in the aquarium industry. Not surprisingly, the industry soon identified him as one of several experts on control and treatment of diseases of captive-held elasmobranchs.

George’s (and Judi’s) impact on the professional community of the Tennessee Aquarium was immense, and his accomplishments there were many. George’s scientific endeavors there had a regional and national footprint, and he rapidly generated a large amount of research and conservation activity that administrators at the aquarium could take credit for and be proud of. A few years after being hired there, George would convince the aquarium’s administration and board of directors to back a research institute. Opened in 1997, he was the founding director of the Southeast Aquatic Research Institute (SARI), the Tennessee Aquarium’s research and conservation unit. Never one to piddle around with catchy acronyms, George did chuckle from time to time about the unfortunate phonetic of the institute’s acronym. Later, the institute would be rebranded “Tennessee Aquarium Research Institute” (TNARI), which caused George and colleagues associated with the institute to repeatedly say, “*We’re not ‘sorry’ anymore!*” The institute is now called the ‘Tennessee Aquarium Conservation Institute’ (TACI).

SARI provided a platform with which to host research interns under the aquarium’s umbrella, and George used it as a training ground for several students who would go on to become graduate students in the aquatic sciences and parasitology. George built the institute from the ground up, initially (1994–1996) hosting students in the top floor of the aquarium’s main building. During these early years at the aquarium and leading up to the formal founding of SARI, George collaborated extensively with David (“Dave”) E. Collins (Tennessee Aquarium) and others on issues related to various aquatic species of the southeastern US, including threatened and endangered mussels, turtles, fishes, and crayfishes. In 1994, George and Dave hosted the *Aquatic Fauna-In-Peril Conference* in Chattanooga, the first meeting of its kind specifically focused on the southeastern US. As an outcome of that meeting, in 1998, they co-edited “*Aquatic Fauna In Peril: A Southeastern Perspective*.” This was the first integrated and distilled information on imperiled aquatic species in the southeastern US. Including an endorsement from Edward O. Wilson and chapter contributions from senior biologists who had been working in the region

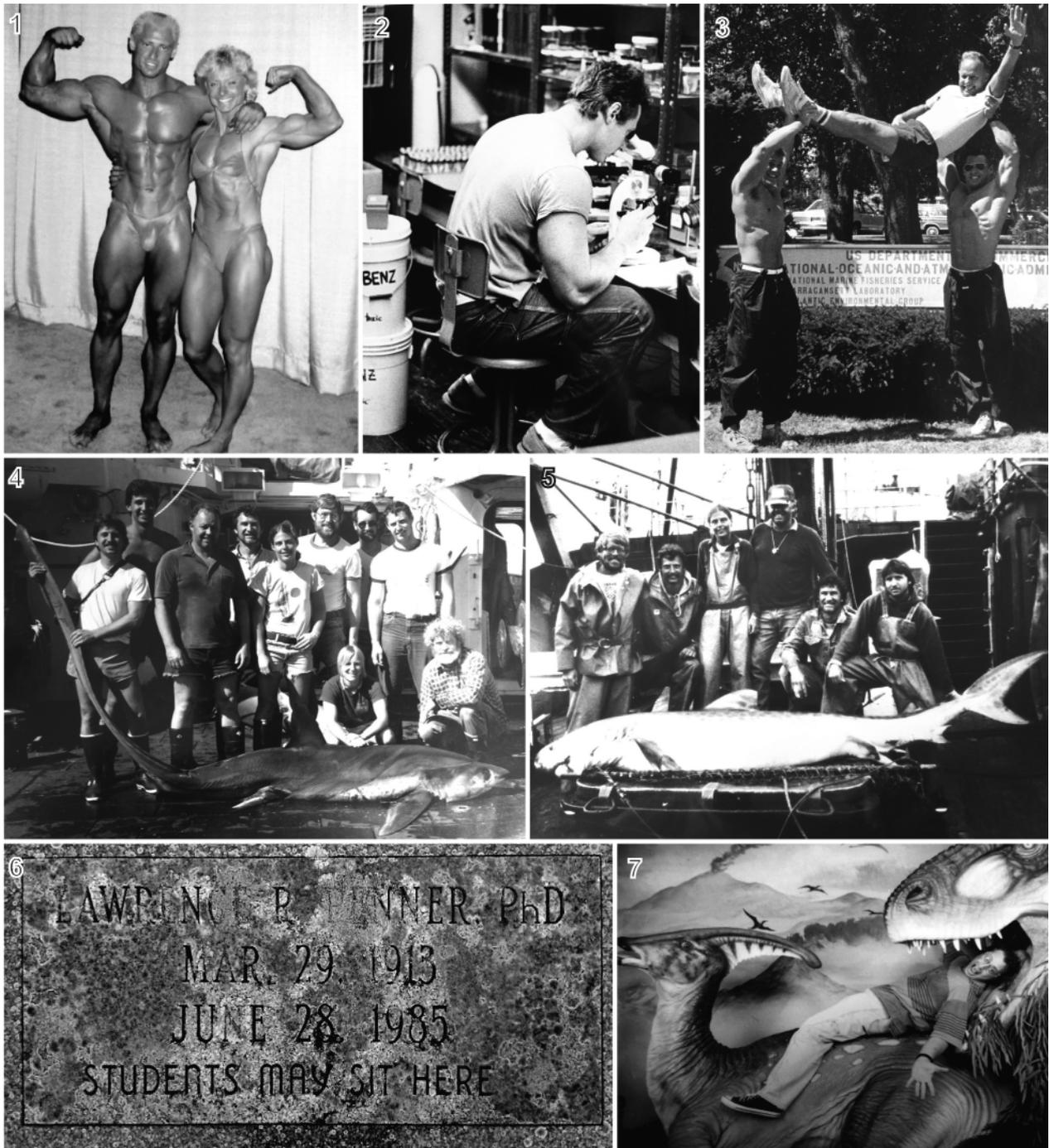
for decades, the book includes both conservation status and management chapters for each major faunal group. George was also especially proud of the fact that all of the header artwork for the book was created by one of his SARI interns, Thomas Tarpley. In 1998, George hosted the TRAFFIC meeting, “*Symposium on the Harvest, Trade, and Conservation of North American Paddlefish and Sturgeon*,” organizing also its proceedings. In 1999, he hosted the inaugural meeting of the Freshwater Mollusk Conservation Society in Chattanooga. This society now includes >700 members and publishes its own journal.

These achievements are a testament to George’s ability to engage others and very rapidly ‘get up to speed’ on issues and complex problems. Before being hired at the aquarium, George had little experience with non-game inland fishes or freshwater invertebrates and, as a New Englander, he was a newcomer to the region and its culture. Yet, only a few years after ‘immigrating’ to the southeastern US, George had become deeply involved and familiar with, and was playing a leadership role in, regional conservation issues in Tennessee and adjacent states. Of course, all the while George maintained a steady stream of scholarly contributions on copepod taxonomy and parasitology, which he coauthored with his own SARI interns as well as colleagues abroad. George affected the lives of many students at SARI, including (chronologically) William “Bill” Sullivan, Joshua Kohl, Jeffery Braswell, Ryan Otting, Brian Smith, and Thomas Tarpley as well as three students who would later go on to earn graduate degrees in Parasitology from Robin M. Overstreet (Gulf Coast Research Laboratory, Ocean Springs, Mississippi): Kristy Smedley, Josh Cook, and me. George truly enjoyed working and interacting with his students. ‘Lunch Club,’ instituted by George and driven by his passion for cooking (and eating), was a rotation that included several SARI interns and aquarium staffers, each of whom would prepare lunch for the group each Wednesday. George used such rituals as a vehicle for human interaction as well as a means of observing human behavior. Some lunches were horrific but many were very good, with George typically outshining the rest of us with dishes like goopy chicken (chicken baked with BBQ sauce), root soup, and pig’s feet followed by Mount Fuji (a complex, massive casserole-sized dessert comprising multiple layers of chocolates, cream, cake, and syrup).

A powerful field biologist, George thought that field work was critical in helping students learn about themselves and their career path. By working with his friend Mark A. Grace (NMFS Southeast Fisheries Science Center, Pascagoula, Mississippi), who in 1995 had initiated shark longline surveys in the Gulf of Mexico, he developed a pipeline for sending interns to sea to collect parasites from landed sharks. Beginning in 1995, these included cruises aboard the NOAA R/V *Oregon II* and later included NOAA R/Vs *Gordon Gunter* and *Pisces*. With help from friends Lisa Natanson and Nancy Kholer in Narragansett, he also placed students aboard the R/V *Pelican* and NOAA R/V *Delaware II*, the same ship he

had originally sailed on with Wes, Nancy, and Greg in the 1970’s and 80’s. Mark, George, and I would twice sail together aboard the *Gordon Gunter*. George would stay awake for days on end, ensuring to be awake and ready for action after every ‘haulback’ (retrieval of a longline or trawl and processing of fishes). While most of the science crew on these boats rotate 12 hour shifts, George would be on call 24-7 for the length of the 2–3 week-long cruise; catching a cat nap here and there or sleeping for extended periods on long sails between stations. In one instance, George finally fell asleep, but while seated in front of his microscope in the ship’s dry laboratory (in calm seas), his eye sockets firmly seated against the stereoscope oculars. On another cruise, George challenged himself to fast for “*as long as it takes*” and drinking only water. He lasted for over 4 days. George cherished these cruises, and felt great about the opportunity to place students on them as well. From time to time George would say, “*I really need to wet my gills and get out to sea.*” Many times his voice could be heard booming, “*Dude, dig this! This is so cool!*” from across the deck of a NOAA research vessel at 2 AM in the middle of the Gulf of Mexico. Sometimes things were perceived as going ‘too far’ at sea. Daring a colleague that together they could go the entire cruise without showering, the duo was ultimately ordered by the captain of the ship (a NOAA Corps officer) that neither could enter the galley without first showering (apparently the crew had complained that it was distracting to eat dinner in the presence of the stench). George’s solution was to ‘shower,’ fully clothed, with aftershave before going below to have dinner. Perhaps to George’s prankster persona: Shower? Check! Smelling great? Check! It remains to be seen how well this was received by the complaining crew but we can laugh about it now.

In 1996, George accompanied professional photographer and filmmaker Nick Caloyianis to Arctic Bay (Baffin Island) on an expedition to document Greenland sharks swimming under the ice for National Geographic Magazine. George was there to confirm the identity of the shark as well as investigate its feeding habits and its association with a particular parasitic copepod. Nick brought the cameras and film equipment, and George was in charge of fishing gear, which he rigged with advice from local Inuit guides. This was Nick’s second trip, funded by National Geographic, which expected to publish an article on this enigmatic shark. The Greenland shark is one of the most mysterious sharks as well as being among the largest of sharks (>7 m and >950 kg). George’s gateway interest to sleeper sharks was, naturally, in its parasitic copepods. The lernaepodid *Ommatokoita elongata* embeds its bulla (attachment structure) in the cornea of the Greenland shark, and the resulting lesion causes corneal opacity or near blindness in chronic infections, with the prevalence of infection being typically high and each shark typically having a single female *O. elgonata* attached to each eye (Borucinska et al. 1998, Borucinska and Benz 1999). George also was captivated by the fact that despite the shark being regarded as a sort of toothed manatee, slow moving, oafish, and visually-impaired if infected with



**Figs. 1–7.** In Memoriam: George W. Benz; **Fig. 1.** George and Judi Benz during their body building days (c. 1976); **Fig. 2.** George, aside the omnipresent five-gallon specimen buckets marked “Benz,” bio-illustrating a copepod with aid of a Wild M-11 compound microscope equipped with drawing tube; probably in Dr. Larry Penner’s laboratory at the University of Connecticut, Storrs (c. 1977); **Fig. 3.** George (at right) and friend Bill Haney merrily hoisting his new friend and, later, MSc committee member John G. “Jack” Casey on the lawn of the Northeast Fisheries Science Center, Narragansett, Rhode Island (c. 1978); **Fig. 4.** National Marine Fisheries Service science crew aboard NOAA R/V *Delaware II* posing before a male bigeye thresher shark (*Alopias superciliosus*) landed in the Northwestern Atlantic Ocean. From left to right: Gregory B. Skomal, unidentified, John G. “Jack” Casey, Charles “Chuck” Stillwell, Nancy E. Kholer, Harold L. (“Wes”) Pratt, Jr., John J. Hoey, George W. Benz. Crouching: Jill Scharold and Francis G. “Frank” Carey (c. 1980); **Fig. 5.** National Marine Fisheries Service science crew poses before a male tiger shark (*Galeocerdo cuvier*), landed in the Northwestern Atlantic Ocean. From left to right: Harold L. (“Wes”) Pratt, Jr., George W. Benz, Nancy E. Kholer, John G. “Jack” Casey, Charles “Chuck” Stillwell, and Gregory B. Skomal (c. 1983); **Fig. 6.** Gravestone of Lawrence “Larry” R. Penner. Storrs Cemetery, Storrs, Connecticut; **Fig. 7.** George playing with dinosaurs (c. 1994)

*O. elongata*, it was known to harbor seal parts plus swift-swimming fishes in its stomach. George gathered 19th and early 20th century literature on Greenland shark gut contents, which documented fresh seal remains that lacked evidence of extensive putrefaction or digestion; suggesting that scavenging was not likely. Anecdotes from Norwegian fishermen suggested that the parasitic copepods dangling from the eyes of the Greenland shark may luminesce, acting as a lure to entice curious seals, and these unsubstantiated claims were amplified in the literature. George tested the lure hypothesis in the field. The result: “*They don’t glow.*” In the first expedition, taking a pioneering and devil-may-care approach, George and Nick demonstrated that Greenland sharks could be practically fished and studied through 2–3 m of sea ice. In fact, they caught several Greenland sharks, subsequently swimming with and filming them. Their approach was simple and informed by local fishermen: dropping bait (seal blubber) to the bottom through a hole in the sea ice and waiting. The exploits of this expedition are documented in the September 1998 issue of National Geographic Magazine (Caloyianis1998). The opening double-page wide image for the article is a Greenland shark with a female *O. elongata* dangling from its eyeball: only George could make an enigmatic parasitic copepod the star of a National Geographic article. George, wearing a Tennessee Aquarium sweatshirt (markedly underdressed for the Arctic weather), is featured in a full-page image wrenching a 3 m-long Greenland shark from the icy waters. In another large article photo, George’s inverted image is seen through a shark eye lens; perhaps a nod to his MSc thesis work on shark eye lens proteins.

Needless to say, the trip’s successes ignited George’s curiosity about the Greenland shark; he was hooked. Upon his return from the expedition, he immediately began calling his long-time friend Greg Skomal about going back to the arctic to work with Nick. Greg had been to sea with George many times before on the *Delaware II* as he matriculated through Jack Casey’s group in Narragansett. Greg’s research interests include satellite telemetry and acoustic tagging of sharks to examine migratory behavior as well as daily movements of large oceanic fishes. Greg stated, “*George and I come from the same general school of thought when it comes to marine biology: work hard, enjoy the privilege of getting paid to do what you love, and, above all, laugh. Albeit, the latter usually came at somebody else’s expense, but we were never exempt. Fellow shipmates on research cruises, which can last up to seven weeks, would either love us or hate us, and I pitied those that didn’t take to our humor.*” Obviously compatible in the field and as scientific collaborators, George and Greg had a ritual whereby the day after Christmas, after being with their families, they (along with Judi) would meet for lunch at New Haven’s “*The Captain’s Table,*” overlooking New Haven Harbor. On 26 December 1998, George wanted to talk National Geographic specials and Greenland sharks. George was involved in hosting a National Geographic TV documentary called “*Body Snatchers,*” which focused on parasites. George convinced the production crew

to film on Martha’s Vineyard, where Greg lived at the time, and George wanted his input on where to film on the island. Having covered that, it was then time to talk about Greenland shark biology and his recent Arctic trip with Nick. They spent several hours over beer and fried seafood (Judi nibbling on a salad with iced tea) going over the body of literature before George pitched his idea to Greg. Extensive planning over many months ensued, and, in May 1999, George and Greg accompanied Nick, who was again working for National Geographic, to the Arctic.

Their plan was “simple:” capture, tag, and release several Greenland sharks to track their movements under the ice and learn about their daily behaviors and feeding habits (Skomal and Benz 2004). They worked with local Inuit guides and transited many miles across the frozen Arctic sea acoustically tracking Greenland sharks (the first time the Greenland shark had been acoustically tracked under ice). Nick photographed and filmed everything. They succeeded in tagging six sharks, and their results indicated that Greenland sharks may indeed hunt, not scavenge, seals in areas where land-fast sea ice was located. George and his colleagues developed a theory that Greenland sharks hunted seals by ‘cornering’ them in their tunnel-like holes in the arctic ice; seals being trapped ‘between a rock and a hard place,’ that is, between an apex predator both above (polar bear) and below (Greenland shark) the ice. Cuts from this trip were spliced into Discovery Channel’s “*Jurassic Sharks*” in July 2000. With titles like “*Shark Research at the Top of the World,*” “*Sharks under ice!*,” “*In Search of the Ice Shark,*” and “*Putting the Bite on Jaws,*” George also packaged these scientific adventures into hour-long (or at least they were scheduled for one hour!) public lectures that he presented at public aquaria in California, Connecticut, Florida, Ohio, and South Carolina, or wherever he was being hosted or visiting at the time. The audiences for these lectures included a large number of conservation-minded citizens. George used these lectures as a teaching and training opportunity to discuss the process of biological investigation, including statements like, “*sometimes we have to kill things to learn from them,*” to introduce slides of seals used as shark bait as well as hemisected Greenland sharks. Additional media coverage of the Greenland shark work comprised “*Corkscrew killer*” (2009; National Geographic Explorer TV) and “*Alaskan Killer Sharks*” (2009; National Geographic Channel) as well as pieces in *Der Spiegel*, *Der Standard*, *Highlights for Children*, and *Discover*. During the filming of one of these media works, George was asked to dive with a re-breather, ‘bubble helmet’ to deliver his monologue. George called the bubble helmet, “*The Widow Maker,*” and Judi, who was on the scene during filming, was not pleased nor amused. George delivered his monologue and all went according to plan.

Leading up to the founding of SARI in 1997, George moved the laboratory across the Tennessee River, moving into a renovated, excised portion of the aquarium’s gift shop warehouse. There, George designed a suite of large rooms cut out of the warehouse that comprised wet-, necropsy-, and microscopy laboratories plus a spacious

office suite. Inspired by a scientific article that indicated wall color can affect human behavior and creativity, George painted the walls of each room in an intense pastel of pink, yellow, and blue. George loved that everyone referred to the laboratories by their colors. In addition, George had negotiated with Zeiss to equip the laboratories with the best optics. And so was founded a state-of-the-art, completely new, fully-equipped, pastel-colored parasitology and aquatic science laboratory within a downtown Chattanooga warehouse.

George always created an environment wherein everyone felt comfortable to share ideas freely and, of course, prank each other. Although George was usually the ringleader of such mischief (e.g., super-gluing all of one's desktop items to their desk), from time to time, rarely, it came around to George as the one being pranked. One of George's interns secretly placed several paper cups full of maggots among the duct work above the ceiling tiles in George's office suite, right above his desk. This student had harvested some maggot-ridden chicken from a trashcan at a local lake-front public park. A little while later, George's pastel-colored laboratory was darkened by a swarm of newly-emerged flies. Initially not realizing it was a prank, George was dismayed then quickly and intensely fascinated by the plague: *"You just can't believe how amazing it is, there are flies EVERYWHERE!"* After a few additional waves of emerged flies, George soon deduced that the swarm was, in fact, a biological weapon and set out to identify who launched it. As wave upon wave of flies emerged, the prank approached hazard, and the staff of the aquarium's gift shop warehouse were becoming concerned about what sort of biological processes were playing out in the pink, yellow, and blue laboratories. After a brief but intense inquiry, the culprit was identified and the plot revealed. In hindsight, I think George was proud that one of his own students would be so ingenious with a biological agent. But it never happened again.

As SARI continued to grow with George at the helm, in 1998 he hired Paul D. Johnson (now Alabama Department of Conservation and Natural Resources, Marion, Alabama). In 1999, having outgrown the warehouse laboratory, George and Paul moved SARI to the countryside, the site of a former federal fish hatchery in Cohutta, Georgia. There, the institute occupied a large house across the street from the hatchery facility and took advantage of its recirculating aquaculture systems. They renovated and built new systems supporting sturgeon, snails, freshwater mussels (housed within the 'Mussel Palace'), crayfishes, and various stream fishes. Without hesitation, George again was entering into a new realm and charging full steam ahead. He also continued to host student interns on site as well as serve on graduate committees through the University of Tennessee Chattanooga. George, Paul, and colleagues handled a tremendous diversity of projects via SARI that covered several states: Mobile River Basin freshwater mollusk recovery program, freshwater mussel inventories for the Upper Coosa River, Duck River, and Cahaba River, lake sturgeon reintroductions

in the Tennessee River Basin, Tennessee River Gorge turtle conservation initiative, experimental fish host determinations for several Georgia freshwater mollusks, Georgia bog turtle conservation, and barrens topminnow restoration. During his time as director of SARI, George published 25 peer-reviewed articles. However, although excited about these projects and still producing research on parasitic copepods, George remained keen on advising/chairing his own graduate students, lecturing on a big university campus, and being immersed in an academic setting and culture. It was time for a move.

After flirting with a few such positions in Alabama and Mississippi, in 2003, George accepted a tenure-track position in the Department of Biology at Middle Tennessee State University (Murfreesboro). Finally, George had a station at a large university campus. Very soon thereafter, Judi was hired at the Nashville Zoo, about 45 minutes away from Murfreesboro, as Director of Guest Services to manage ticket sales and retail personnel. In 2008, George was promoted to Professor. At MTSU, George carried a heavy teaching load (12 or more contact hours per semester) and instructed undergraduate majors' core courses as well as electives and non-majors' courses, including freshmen biology, ichthyology, marine biology, and graduate seminar. George had a rather unique office and laboratory set-up at MTSU. He secured an office and small laboratory within the charming Haynes House, an early 20th century residence engulfed by MTSU's expanding campus boundaries. This building was more or less 'off the grid' relative to his other departmental colleagues, who were stationed in the biology building. George shared Haynes House with a few other departmental faculty, and, over time, he began to attract other faculty to claim office or laboratory space there. George was very happy at MTSU, having landed among a group of close colleagues with which to converse and collaborate on a daily basis, including R. Stephen ("Steve") Howard, Andrew ("Andy") Van Zandt Brower, Sarah Bergemann, and Chris Herlihy. A valued departmental citizen but not always the voice of popular opinion, George spoke his mind and fought the good fight to keep standards high, pushing back on so-called retention policies and the other forms of loosening or lowering of academic standards.

Of course not surprisingly, George thought of lecturing as a wonderful privilege and put a lot of heart into his courses; spending an inordinate amount of time meticulously preparing or updating lecture notes and PowerPoint presentations for his undergraduate and graduate students. Although he toyed with the idea of having some of them converted for distance learning (online courses), his enjoyment in lecturing and interacting with his students first-hand precluded that from ever happening. For some courses, he would require extensive writing assignments, which he would evaluate at different stages of manuscript development by the student; in essence simulating the process of coauthoring a manuscript with a student. George trained graduate students Andrew McElwain (State University of New York, Oswego), David R. ("Randy") Stewart (US Fish

and Wildlife Service, Southwest Region, Albuquerque, New Mexico), and Eric R. Salmon, and he co-chaired PhD student Susan Dippenaar (University of the North, South Africa). Susan commented that, “*he (George) taught me everything I know about how to work with copepods and, after spending a month with him, he changed the course of my research interests. I could not help but be infected by copepods.*” His laboratory at MTSU also supported undergraduate researchers Eric Salmon, Bailey McMeans, Joy M. Young (Florida Fish and Wildlife Conservation Commission, Tequesta, Florida), and Kaitlen Howell (Benz et al. 2006, 2007, McMeans et al. 2009, Ulicny et al. 2007, Young et al. 2013). While at MTSU he published 24 peer-reviewed articles and two book chapters treating taxonomy and biology of fish parasites (Benz and Bullard 2004, Bullard et al. 2004b, 2012, Dippenaar et al. 2004, Benz 2005, 2006, Benz et al. 2006, 2007, 2011, Blend et al. 2010, McElwain et al. 2010, Tang et al. 2012), sleeper shark biology (Benz et al. 2004, 2007) and movements (Skomal and Benz 2004), stable isotopes (McMeans et al. 2009), inland fisheries biology (Stewart et al. 2009), and host-parasite relationships (Frasca et al. 2004, Bullard et al. 2011, Kik et al. 2011, Young et al. 2013). Soon after the 2010 BP Deepwater Horizon oil spill occurred, George and I were funded by NSF to begin an ecosystem function study using the parasite component community of Gulf killifish (*Fundulus grandis*) in Bay Jimmy (a heavily oiled marsh) and adjacent waters within Barataria Bay, Louisiana. To arrange for logistics of sampling Bay Jimmy, George cold-called the Louisiana Department of Wildlife and Fisheries (LDWF) laboratory in Grand Isle, Louisiana. Soon thereafter, George had secured the in-kind support for all field collections. This blossomed into a 3-year collaboration with Clint Edds and colleagues at the LDWF Grand Isle Marine Laboratory, which ultimately provided research and field experiences to several graduate and undergraduate researchers at MTSU as well as Auburn University.

In his MTSU office, among many other things, George prominently displayed a framed glossy photograph of a physicist as well as an eel-infected shark heart, both of which speak to his academic persona and scientific philosophy. The physicist Richard Feynman (1918–1988; CalTech University, Pasadena, California) was one of George’s favored authors and science personalities. One of George’s former undergraduate researchers (Bailey) gave George the portrait of Feynman, which he displayed above his desk (this image was taken during the Rogers Commission investigations on the 1986 Space Shuttle Challenger explosion). Feynman’s facial expression is one of apparent disgust, and George thought it was an accurate outward reflection of his own feelings about bullshit and bureaucracy; his general intolerance for double talk and rhetoric. George would recommend to his students Feynman’s book, “*What do you care what other people think!!!- further adventures of a curious character.*” Therein, Feynman proposed that scientists who understand how and why things appear beautiful have a deeper appreciation for the beauty of things by way of their deeper

understanding of the underlying physics or biology of the beautiful thing. The scientific knowledge adding to the beauty rather than subtracting from it. George certainly pursued such deeper understanding of how things worked, as evidenced in his early pioneering works on attachment and spatial distribution of parasitic copepods as well as his gold-standard taxonomic treatments of copepods. And, George simply had that sort of burning curiosity for the mechanics of things. About the eels... The framed image of two pugnose eels (*Simenchelys parasiticus*) within the heart lumen of a shortfin mako shark (*Isurus oxyrinchus*) was taken from figure 1 of Caira et al. (1997, George as a coauthor), wherein the bizarre occurrence was reported. Caira (1998) reported that, despite not having much beforehand knowledge of pugnose eels, George commented, “*What do the eel people know that we couldn’t find out?*” Caira (1998) noted, “*George’s courage to enter and then completely master fields initially unknown to him.*” Also on that figure is a pencil (used as a scale bar) inscribed, “*every idea is a link in the chain of progress,*” and within the framed image George himself inserted the quote, “*Spawned from wonderment of its trivial handiness, humankind has swallowed the myth of its demigodery and hence cannot fathom or accept the technologically unfettered accomplishments of evolution.*”

Doubtless, George had an insatiable curiosity for how nature works. I believe George had that same level of curiosity for how *people* work too, especially regarding the twists and turns in life that create legendary scientists and their motivations. The last publication George completed is a beautiful presentation of the life of his hero Bob Kabata, which George crafted in close partnership with another of Kabata’s admirers and close friends, Timothy “Tim” M. Goater (Vancouver Island University, Nanaimo) (Benz and Goater 2015). Its title makes clear a desire to understand the makings of such a scientist: “*Zbigniew Kabata- Metamorphosis of a Parasitologist.*” George admired productive people in general and was curious about how they achieved. This curiosity about the details and inner workings of things and people also made it easy for George to relate to and engage with people of a wide diversity of backgrounds, professions, philosophical views, and spiritual beliefs. George often referred to an especially prolific scientist as a “*force of nature*” or one having a lot of “*horsepower.*” He also loved naming parasites after his admired colleagues: for Kai, *Jusheyus shogunus* Deets et Benz, 1987; Bob, *Albionella kabatai* Benz et Izawa, 1990 and the now famous binomial *Bobkabata kabatabobbus* Hogans et Benz, 1990; and Janine, *Janinecaira darkthread* Benz, Smith, Bullard, et Braswell, 2007 (because this particular eudactylinid looks like a dark thread).

A pragmatist, George often advised to “*boil it down*” for readers and make work useful. I take his advice and offer some of my own based on the experience of writing this work. Interview your mentors. Ask about specific details of their life, their motivations, decisions, influences, and justifications. Ask them about the spaces between the phases of their life. Reportable, successful outcomes can



**Figs. 8–17.** In Memoriam: George W. Benz; **Fig. 8.** During expedition to Arctic Bay, George (center) hoisting a Greenland shark (*Somniosus microcephalus*) from the icy waters off Baffin Island while Inuit guides handle rigging and look on (1996); **Fig. 9.** At sea aboard the NOAA R/V *Gordon Gunter* in the north-central Gulf of Mexico, George dissects an electric ray (*Torpedo nobiliana*) captured by deepwater trawl. Note that George is wearing rubber gloves, which he normally would not ever do while dissecting an elasmobranch, to protect from potentially dangerous post-mortem electrical discharge (Oct 2002); **Fig. 10.** At sea aboard the NOAA R/V *Gordon Gunter* in the north-central Gulf of Mexico, George displays the photogenic John Dory (*Zenopsis conchifera*) (Oct 2002); **Fig. 11.** In Barataria Bay, Louisiana, George looks for potential sites to set killifish traps as part of an oil spill monitoring study (Oct 2010); **Fig. 12.** Enlarged view of George’s forearm tattoo of a swordfish (*Xiphias gladius*); **Fig. 13.** Enlarged view of George’s shoulder tattoo of a mako shark (*Isurus oxyrinchus*); **Fig. 14.** At sea aboard the NOAA R/V *Gordon Gunter* in the western Gulf of Mexico, George searches for parasitic copepods within an olfactory bulb of a skate captured by deepwater trawl (Oct 2002); **Fig. 15.** George (far left) in costume during the annual Halloween costume party event “*Ghouls at Grassmere*,” Nashville Zoo (Oct 2008); **Fig. 16.** George (front row, far left) sporting enhanced regalia prior to graduation ceremonies at Middle Tennessee State University. Note additions of animal skins, plastic skeletons, and cane to the traditional graduation regalia of his alma mater University of British Columbia. Others in the photo: R. Stephen (“Steve”) Howard, Sarah Bergemann, Andrew (“Andy”) Van Zandt Brower, Chris Herlihy, and Jeffrey (“Jeff”) Walck (Dec 2012); **Fig. 17.** George (center) with the author (left) and Paul D. Johnson at Little Italy, their favorite bar and pizza joint in Auburn, Alabama (22 Nov 2013)

be sourced from a dossier but the preceding decisions and rationales cannot. Nor do we typically report our failures—yet these are the seminal events that mostly shape the lives of fearless people, who “fail” routinely. Parasitologists are indeed as parasites with complex life cycles, with distinct life history stages, yet a continuum, whose luck, successes, and routine failings determine where, if, and who they ‘infect.’ Mentors, tell your students about your life; good students will cherish such insights as much as you enjoy sharing them. “*We would each be wise to reexamine our personal and professional compasses, revitalize our best efforts, and above all, pass on only true bearings to our academic and biological children*” (Benz and Goater 2015).

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## Appendix A

## Publications of George William Benz

## PERIODICALS

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#### BOOK/PROCEEDINGS CHAPTERS

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