

# Malcolm Roy Clarke, FRS<sup>\*</sup>

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*Malcolm Roy Clarke, FRS (1930–2013) made lasting contributions to cephalopod biology through his productive research programme, his commitment to furthering cephalopod biology and his congenial spirit. His professional legacy includes many important contributions. He wrote over 150 scientific papers, book chapters and other scholarly works, including the Discovery Report on the role of cephalopods in the diet of sperm whales in the Southern Hemisphere, he edited A handbook for the identification of cephalopod beaks, which made the study of trophic interactions more accessible, and with colleagues he developed and instituted the Cephalopod International Advisory Council to provide advice on cephalopods and a framework for international meetings. His impact on marine science was broad and longstanding.*

**Keywords:** Malcolm Clarke, cephalopod, sperm whale, Cephalopod International Advisory Council, Azores

Submitted 19 December 2013; accepted 26 January 2014; first published online 11 March 2014

## INTRODUCTION

Malcolm Clarke was an innovative, productive and enthusiastic scientist. He was also a most engaging, charismatic personality and he had a great many colleagues worldwide who counted him as a friend and mentor. They could all write about their own recollections of time spent with Malcolm in the field, in the laboratory and of course in the pubs, bars and cafés they retired to together for refreshment. The authors were invited to contribute to the symposium organized as a celebration of his life and work at the World Congress of Malacology meeting, Ponta Delgada, Azores in June 2013. We each had stories to tell about him as each of us had worked with him as a colleague, both in his laboratory at Plymouth and at long distance. Sadly Malcolm died shortly before the Symposium, so our presentations formed a unique obituary, which is presented here in three parts.

## A LIFE IN SCIENCE—BY PAUL G.K. RODHOUSE

Malcolm Clarke was born in 1930 during a period of renaissance in oceanography and growth of interest in the biology of the Southern Ocean. The first Discovery expedition had left the UK five years earlier in 1925 (Hardy, 1967), and in 1930 the British, Australian and New Zealand Antarctic Research Expedition (BANZARE), led by the Australian Douglas Mawson, was under way (Price & Grenfell, 1962). In the USA the Woods Hole Oceanographic Institution was

established on Cape Cod, and scientific interest in the oceans was gathering worldwide.

The work of the Discovery Committee, which ran for 55 years, was to research the ecological basis of the productivity of whale populations in the Southern Ocean, especially the processes leading to production of their food (Hardy, 1967). The work was carried out at sea in Scott's ship 'Discovery', in the steam trawler 'William Scoresby' and later in the purpose built 'Discovery II', and ashore at Discovery House on King Edward Point close to the whaling station at Grytviken, South Georgia. Malcolm started his scientific career as a whaling inspector, collecting scientific data aboard Christian Salverson's pelagic whaling factory ship 'Southern Harvester' in the season of 1955–1956—a vessel described by a colleague as noisy, smelly, uncomfortable and claustrophobic! The data and samples Malcolm collected were used for his PhD research on whale parasites, but in delving into the digestive tracts of whales he was to gain considerable insight into the diet, particularly of sperm whales. This was to shape his later career.

Malcolm completed his PhD at the University of Hull, which was awarded in 1959, and joined the National Institute of Oceanography at Wormley, Surrey in 1958, where the research initiated by the Discovery Committee was continuing. There he worked with a young scientist, Dick Laws, whose research was also on whales at that time and who later became the Director of the British Antarctic Survey. For fourteen years, Malcolm walked under the figurehead of HMS 'Challenger' each day as he went to work in his laboratory where his research was to become focused on squid and their role in the biology of sperm whales. In 1962 he published his first paper on the subject, which highlighted the information that could be obtained on sperm whale migration from squid beaks in the stomach contents (Clarke, 1962).

In 1972 Malcolm left the Institute of Oceanographic Sciences, as it was known by then, and moved to the Marine Biological Association of the UK (MBA) at Plymouth. Eric Denton was Director of the MBA at that time, and he and

<sup>\*</sup>This article is from 'The Role of Cephalopods in the Marine Environment, a Symposium in honor of Dr. Malcolm Clarke, FRS', presented at the World Congress of Malacology, July 2013, Ponta Delgada, Azores.

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**Fig. 1.** Photograph of Malcolm Roy Clarke, authors and colleagues, at the 1988 Cephalopod International Advisory Council meeting held in Washington, DC, USA. Bottom row, 3rd–5th from left: C.C. Lu, Malcolm Clarke, Paul Rodhouse. Centre row, 5th from right: Clyde F.E. Roper.

Malcolm collaborated productively on several scientific problems that engaged their mutual curiosity. Malcolm had already published on buoyancy in the sperm whale (Clarke, 1970), and his work with Denton and others led to new insights on buoyancy in ammoniacal squid (Clarke *et al.*, 1979).

Malcolm retired from the MBA in 1987. During his time there he had published what some would say was his *magnum opus*, the *Discovery Report* on the role of cephalopods in the diet of sperm whales in the Southern Hemisphere (Clarke, 1980). This was the last *Discovery Report* to be published, and was a fitting end to this increasingly important body of knowledge. Malcolm built on these results to produce estimates of global consumption of cephalopods by sperm whales (Clarke, 1983) which drew attention to the enormous biomass of cephalopods in the world's oceans, which had not previously been recognized—largely because of the difficulty of catching cephalopods, especially squid, with research nets, and because squid fisheries at the time were mostly small-scale artisanal operations close to shore.

In the course of his career Malcolm produced over 150 scientific publications on subjects including whale parasitology, buoyancy and migration, cephalopod taxonomy, morphology, physiology, ecology and palaeontology. He also devised the concept of the opening/closing rectangular midwater trawl (RMT) for sampling discrete depth layers, and developed this with a small group of scientists and engineers (Baker *et al.*, 1973). Later he added lights to the design to increase its efficiency for sampling squid (Clarke & Pascoe, 1985). He edited *A handbook for the identification of cephalopod beaks* (Clarke, 1986), which opened up this arcane branch of marine biology and enabled scientists worldwide to contribute to knowledge about the role of cephalopods in marine ecosystems.

As well as pursuing his own science, Malcolm provided leadership as Principle Scientist on numerous research cruises aboard ships including RRS 'Discovery', RRS 'Challenger' and the GO 'Sars'. His encouragement of students and early career scientists ensured that his work was developed further and inspired new lines of investigation in many directions. Malcolm was an enthusiastic collaborator and worked with scientists from all over the world individually and in groups at various workshops that he organized. His

work with scientists at the British Antarctic Survey provided a strong link between the mid-20th Century work initiated by the Discovery Committee and current research on Southern Ocean ecosystem biology (Murphy *et al.*, 2007; Rodhouse, 2013). It was in 1985 that I spent most of the year working with Malcolm at the MBA immediately after joining the British Antarctic Survey and during a transition period in my career when I was shifting my research focus from bivalve molluscs to cephalopods. It was Malcolm's collaborative nature that led to his role in founding the Cephalopod International Advisory Council (CIAC) in the 1980s (Figure 1) which has grown in strength and had its latest symposium at Florianopolis in Brazil in November 2012. Malcolm's scientific life is summarized in Table 1.

#### A FRIEND, TEACHER AND MENTOR—BY CHUNG-CHENG LU

Malcolm was an enthusiastic teacher in the classroom, during a cruise or at the table. I met him for the first time in 1972

**Table 1.** Scientific milestones in the life of Malcolm Roy Clarke, FRS.

Year	Milestone
1930	Born Birmingham, England
1955	Earned BSc in Zoology, University of Hull, Hull, UK
1954–1955	Employed as a British Government Whaling Inspector
1959	Completed PhD, <i>Parasites of Marine Mammals</i> , University of Hull
1958–1972	Employed at the National Institute of Oceanography, Wormley (later Institute of Oceanographic Sciences)
1972–1987	Employed at the Marine Biological Association, Plymouth UK
1978	Awarded Doctor of Science, DSc by the University of Hull, Hull, UK
1981	Elected Fellow of the Royal Society, FRS
1987	Retired from the Marine Biological Association
1990s	Built Sperm Whale and Squid Museum on Pico Island, Azores, Portugal
2013	Died Pico, Azores 10 May

when he was invited by the Memorial University of Newfoundland, Canada, to be one of the examiners of my PhD dissertation. Later that day, Malcolm offered me the opportunity to work with him in the Plymouth Marine Laboratory on the cephalopods in the Discovery Collection. That started a long working relationship and friendship with Malcolm.

The Discovery Collection vertical distribution series was made by the UK National Institute of Oceanography (NIO) sampling with opening–closing nets in the North Atlantic. There were approximately 4000 specimens of 60 species to be examined. Malcolm and I worked hard on this and published four papers on distribution (Clarke & Lu, 1974, 1975; Lu & Clarke 1975a, b). I had no idea what I was agreeing to when I accepted this invitation, and Malcolm did not know it would be the first time that I would look at many of the species. That Malcolm entrusted me with such an important project showed great generosity and trust. He was a good teacher, and whenever I had a question he was always available for discussion. We would examine specimens together, discuss the taxonomic characters and make identifications together.

Malcolm was always very thorough and almost single minded when he was engaged in a project. He was a very talented man, and these talents seemed to know no bounds. In science, not only was he an expert on squid and whales, he also had a deep knowledge about parasitology. During a trip to northern Victoria we visited a national park and whilst he was conversing with the park rangers on the parasites of local freshwater turtles it turned out that he was well acquainted with their life history!

Malcolm was keen to catch squid so he could examine their beaks and link them to the beaks from predators' stomachs. In order to achieve this he had to develop new sampling methods and he devised the concept of the Rectangular Midwater Trawl (RMT<sub>1</sub> + 8). This net was used extensively in the sampling of the Discovery vertical distribution series. Later he added lights to the design to improve its efficiency for catching squid.

His research on cephalopod beaks is well known, but it was not always pleasant, as he often worked on the stomach contents of sperm whales. Anyone who has gone near whale stomach contents would know how smelly they are. Yet he did not hesitate to handle them, to examine them. When he visited me in Melbourne to examine some of the material from the old whaling station in Albany, Western Australia, we were persuaded by assistants to work in the museum courtyard to keep the smell outside. He had no problem with that, and worked contently in the museum courtyard for several days. In the course of this he related how, while working on whale stomach contents in Durban, South Africa, he never had a problem getting a seat on buses as the passengers tended to stay away from him when he got on!

Malcolm was certainly a hands-on man. I had an opportunity to spend a week with him on a research cruise in the Bay of Biscay. The weather was rough and the fishing poor, but the cruise leader, Malcolm, was cheerful and got involved in every aspect of the trawling operations, including helping to haul the net on deck. Over his career he spent a lot of time on ships; he once estimated that he had spent over three years of his life at sea!

Malcolm was never afraid to stretch himself with tools of all sorts: technology, construction or paintbrush. When laptop

computers first appeared, Malcolm got in early. I remember listening to him about all the problems he had with his new machine, but he was always ready to tackle new technology—often before his peers. On one occasion he gave a paper to a meeting in Germany and was awarded a bottle of wine for being the one scientist over the age of 45 who used a PowerPoint presentation! Nevertheless, despite his fondness for technology, his favourite 'tool of the trade' remained a stumpy little pencil and notebook!

Malcolm's talent also showed in daily life. His first house that I saw in Cornwall, had a large swimming pool and I learned later that he had built it himself! In one of his houses he built a conservatory and in another house a laboratory where we finished our work on the cephalopods of Madeira (Clarke & Lu, 1995). He was also very artistic. He was an active and very good painter of landscape and marine subjects, particularly as you might guess, whales and whaling.

Malcolm was unpretentious, easy going and always cheerful. That quality made him a great travelling companion. He and I travelled together in the United Kingdom, Taiwan, New Zealand, Australia and France, and during those trips, he always had fantastically funny stories to tell. Many of those were based on his own experiences. He had a wonderful ability to laugh at himself, and we can all learn from him how not to take ourselves too seriously.

Malcolm was not only a personal mentor and teacher to me, but he also wanted to be sure that robust cephalopod science was encouraged worldwide and would be ongoing into the future. One of his lasting achievements was his instrumental role in the establishment of the CIAC <http://www.abdn.ac.uk/CIAC/>. During the Workshop on the Biology and Resource Potential of Cephalopods—held in Queenscliff, Victoria, Australia in March 1981 (Roper *et al.*, 1983)—he presented the idea of forming an international body of experts on cephalopod biology with the following functions: to provide information about cephalopods to research and fisheries agencies; to co-ordinate international workshops and meetings; to make recommendations concerning cephalopod research; and to set up training courses on the identification and study of cephalopods. Three months later, during the Cephalopod Beak Workshop in Plymouth, UK, which Malcolm organized (Clarke, 1986), a charter group of the CIAC was formed. The group convened a Committee to develop the organizational structure. Naturally Malcolm carried the bulk of the work load. In September 1983 the Charter Committee met at Laboratoire Arago, Banyuls-sur-Mer, France, and formally accepted the charter and resolutions and elected the first regular council members. The objectives of CIAC are: to stimulate and to influence scholarly research on cephalopods from an international perspective; to provide information, advice, and assistance on all aspects of cephalopod biology, including those associated with the development and management of cephalopod fisheries resources; and to disseminate information on past and current cephalopod research.

The Cephalopod Beak Workshop also had been Malcolm's brainchild. The idea was simple: to bring together cephalopod systematists and workers studying predators of cephalopods to study the beaks dissected from identified specimens. Thirty participants from ten countries took part in the two week workshop. The result of the workshop is the well-known book: *A handbook for the identification of cephalopod beaks*

(1986). The book has become the 'bible' of cephalopod beak identification, and was edited entirely by Malcolm.

Finally, Malcolm was an enthusiastic and well-liked teacher. The many scientists who have learned the identification of beaks from Malcolm are the testament of his teaching skills. In 2003, during a tour of Taiwan, when he gave a few lectures at several universities, his easy going story-telling style absolutely fired up the enthusiasm of the students in the audience.

#### A LIFELONG FRIEND —BY CLYDE F.E. ROPER

Malcolm and his wife Dot collected devoted friends and colleagues around the world. We were invited into his life and have very fond memories of our time with him. A few descriptive words come to mind that help describe Malcolm Clarke: brilliant (but he down-played it); inventive (e.g. the Rectangular Midwater Trawl, with discrete-depth capabilities); funny (and an infectious laugh); gentle; supportive (students, colleagues and family); enthusiastic (always excited about projects and discoveries, his own as well as those of colleagues); a builder (professionally and in home life); and jolly (he saw the humorous, bright side of people and situations). He projected these qualities and inspired those around him to do the same.

Malcolm was a little senior to me, so when I began studying oceanic cephalopods in the early 1960s, I immediately became aware of Malcolm's publications, principally on cephalopods as prey of sperm whales. My first publication on cephalopods (Roper, 1963) dealt with observations of bioluminescence on the oceanic squid, *Ommastrephes* (now *Sthenoteuthis*) *pteropus*. I had dip-netted a specimen in the Gulf Stream off Miami one night and put it in a large bucket of seawater for later examination and preservation. Almost immediately it began to 'glow' on its ventral surface from numerous, very small, round photophores, previously undescribed. Later, in my first exchange of letters with Malcolm (Remember letters? Written on sheets of paper, and sent 'via Air Mail?'), he mentioned having seen bioluminescent flashes from an anterior patch on the dorsal mantle surfaces of *O. pteropus* (and on *Symplectoteuthis oualaniensis* and *Dosidicus gigas*) (Clarke, 1965). I had not seen dorsal flashes, and Malcolm had not seen ventral glows. Forever after, we joked about how he was a specialist on backs, while I (who can hear him chortling now) was a specialist on bellies!

As our professional relationship grew into a personal friendship, we regularly found ourselves in memorable predicaments. On one pleasant occasion I was visiting Malcolm and staying in the Clarke's always-bustling home. On the first morning we left for the Plymouth laboratory with little daughter Zoe sitting quietly in the back seat to be dropped off at kindergarten. Malcolm and I had so much to catch up on that we talked non-stop all the way to the laboratory. As we were about to pull in to the car park, still chatting excitedly, a tiny voice piped up from the back seat, 'Daddy, are we there yet?' Both of us were quite surprised by the revelation that we had completely forgotten about Zoe! Malcolm turned the car around and perhaps set a few speed records getting her back to school. Frequently over the years, Malcolm and I had a good laugh about our absentmindedness. Zoe must surely remember it as well.

Malcolm was a thorough-going 'do-it-yourselfer', and the three sons, Ian, Roy and Alan, were always 'enlisted' to help in various projects around the house and property. Imagine the thrill, enthusiasm and anticipation generated when Malcolm announced that they were going to have their own swimming pool right in their backyard. The fact that they were going to build it themselves might have blunted the enthusiasm a bit, but build it they did, first having a 'digger' tractor in the garden, every little boy's dream, digging the huge hole and finally using shovels to square off good ends, then constructing the pool with linoleum after lining with polystyrene! Every swim must have been doubly appreciated by the whole family with the realization that they had done it all by themselves.

For a number of years the Clarkes lived in a large, wonderful, old Georgian vicarage in the country, with plenty of surrounding open and forested farm land for the kids to explore and enjoy, and with the estuary just down the lane. The nearest neighbours were some distance away, not within quick or easy access of the back yard. The vicarage was reputed to be haunted by the ghost of one of the former inhabitants. Of course, that made a great story to tell visitors, especially overnight guests . . . just for laughs. However, the fable became reality one day. Dot, after a midnight check on the children, saw a Georgian postman offering a letter to someone in front of an old fireplace that had been covered over in a later renovation. On another occasion, seated around the table one lunch time, all present noticed that Roy was silently transfixed by something happening outside the window, his head turning to follow something moving slowly over the tennis court. He asked 'why is grandma wearing a white dress and carrying her head?'. The family all looked out and were quiet, because there was nothing to be seen. Grandma did not have a white dress and was not in the garden at the time. How exciting and mysterious that must have been for the whole family! I imagine that episode was not mentioned as a potential selling point when the house was put up for sale.

One time when I was visiting, Malcolm and I decided to go for a sail in the Clarke's Drascombe Lugger sailboat, perhaps 6 m in length. We had a marvelous sail in the estuarine, tidal river, enjoying both the sail and the constant conversation, catching up on all things teuthological and familial. Admittedly, neither of us paid much attention to the stage of the tide, and when we realized we had better be getting home, we were quite chagrined to discover that we had mostly gooey mud flats and very little water to sail through. Needless to say, we were late for dinner! I do not recall Dot's reaction precisely, but she would have had every reason to be annoyed. Similar events could not have been unheard of in the always-exciting and active Clarke household.

The give and take of our friendship was the reason for our great success working together in search of a living giant squid, *Architeuthis*. In 1997, National Geographic Television (NGTV) supported an expedition to capture the first video images of this deep sea giant. This was to employ the very clever Critter Cam™, a video camera system that quite successfully had been attached to live dolphins and sea turtles to follow their adventures in their natural habitat. It was felt that the Critter Cam™ could be attached to a sperm whale's head (carefully!) with a large, non-invasive, suction cup. After all, we reasoned, sperm whales were accustomed to the pull of multiple suction cups from their struggling

giant squid prey. When asked by NGTV where the best place to go would be, I immediately selected the Azores as a most promising spot because of the long history and tradition of sperm whaling there ... sperm whales and giant squid. And not the least of the elements in the selection was the fact that Malcolm had worked in the sperm whaling fishery for years, studying their cephalopodan diets. It was a clear and obvious choice to invite Malcolm to join in the expedition. While this venture was unsuccessful in getting images of giant squid being pursued and captured, it did get first-time video footage of sperm whales swimming at depth, and audio recordings of them vocalizing and communicating. Even though there were eight successful deployments of the Critter Cam™ in the Azores, sadly, none captured images of *Architeuthis*.

Following the work in the Azores, it was decided to go to the next obvious location for relatively easy, near-shore access to sperm whales and their giant squid prey, Kaikoura Canyon, South Island, New Zealand. While ashore in New Zealand awaiting completion of work on the chartered ship, the expedition learned of the stranding of three sperm whales up on North Island. Malcolm and I could 'smell' adventure, so we flew up to the remote stranding site to examine the whales, knowing we would have at least thousands of squid beaks in their stomachs, even if not whole *Architeuthis*. While we were disappointingly not allowed to access the stomachs of the three whales (since the whales are protected by Maori tradition) external examination of their heads revealed numerous circular scars, the result of repeated encounters of the whales with a large cephalopod—surely *Architeuthis*! A similar stranding situation occurred later, and we were supplied with a huge collection of over 40,000 beaks, which a delighted Malcolm thoroughly identified during the expedition (Clarke & Roper, 1998). It certainly was impressive to watch Malcolm identify squid beaks, as easily as if they were as different-looking as *Heteroteuthis* animals are from *Histioteuthis* specimens!

## CONCLUSION

After he retired Malcolm moved to Pico in the Azores archipelago with Dot, his wife, and together they built a whale museum near Lajes do Pico, which for many visitors augmented their commercial whale watching trips and their visits to the local museum on the commercial exploitation of whales. Malcolm lived out his days in his Azorean home, which looked out on the feeding grounds of the whales and the habitat of their squid prey. He died on 10 May 2013 and is buried in the churchyard a short walk from the house. His scientific career had started in the era of large scale exploitation of whales and progressed into the enlightened era of their conservation and the enthusiasm of the public worldwide to watch them and leave them unharmed. He discovered much of what we know about the mysterious sperm whales and, of course, the squid that they depend on. We are all very grateful for the time that we knew him, and for the mark that he left on cephalopod biology.

## ACKNOWLEDGEMENTS

We thank the organizers of the symposium to celebrate Malcolm Clarke's life and work that was held at the World

Congress of Malacology, Ponta Delgada, Azores in June 2013. We also thank Peter Herring for sharing his knowledge of Malcolm's life with us.

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