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The 35mm Solution: Photography, Scientists, and Whales

Abstract

The field technique of photographic identification enabled scientists to individually identify and follow cetacea (whales, dolphins, and porpoises) through their life-cycle. Photographic identification relies on portable, high-quality photographic equipment and the naturally occurring markings of individual whales. Being able to identify cetacea individually has enabled scientists to engage in long-term field studies comparable to field studies of land mammals. Further, carrying out long-term field studies has contributed to an exponential growth of scientific knowledge of cetacea and has significantly altered the public's connection(s) to scientists and cetacea.

This article is based on interviews, published material, and observations made by the author at different research settings. It describes how photography and the use of naturally occurring markings of individual cetacea combined to produce photographic identification as a research technique.

As a study within the sociology of science and scientific knowledge, this article highlights the emergent character of scientific research; that is, the emergent confluence of cumulative knowledge, theory, method, and empirical observation.

Keywords

Animal studies; anthropomorphism; fieldwork; naming; photographic identification of cetacean; reliability and validity; sociology of science and scientific knowledge

Prelude

Imagine you are floating on the open ocean close to but out of sight of the shore. You have no landmarks to orient you. There are a few sea birds overhead, some resting, waiting on the water. Perhaps another vessel is in sight, but the ever-present ocean appears as an endless, undifferentiated, restless black sea surrounding you. It is a sea you know supports a cornucopia of life that is invisible to you from the surface. You are in this foreign territory of salt water, floating alone under a pale, listless sky. Somewhere off in the horizon, you notice a black dot seemingly moving on the surface. Intuitively you know that this is one of many living

forms revealing something of it self. You identify it as a whale, and in so doing the black dot is recognized as an object within a relatively undifferentiated field (Strauss, 1969:18-21). If you happen to more closely inspect that object, you will likely recognize specific behaviors, and with sufficient knowledge further differentiate species' behaviors and perhaps identify unique individual behaviors. If all of this occurs, then that "black dot" will have taken on the character of a subject, both as a "subjective" being and as a subject (object) of study. Should that subject become individually identified and catalogued solely on the basis of a particular body part with its distinctiveness, we would recognize this process as objectification. That is, that specific body part with its catalogued coding represents the whole, unique, individual whale. You have taken a long journey: from a dot on the horizon, to an object, to a subject, to objectification. But there is much more to this story.

Introduction

Contemporary social studies of science have often relied on participant observation with research scientists at work. These studies (Fujimura, 1987; Knorr-Cetina, 1983; Latour and Woolgar, 1986; Lynch, 1985; Nutch, 1996; Roth and Bowen, 2001 and 1999; Zenzen and Restivo, 1982, for example) have focused on the numerous aspects entailed in the production of scientific knowledge. One result of these studies has been the recognition of the emergent character of scientific knowledge. In this regard, my study of the development of the scientific technique known as "photographic identification" demonstrates this emergent character of science as the interconnectedness between knowledge about, techniques for, and observations in and of nature. Each dimension impacts the others in producing reliable and valid knowledge of the world. Or as Dewey contended, "warranted assertability."

By sketching the development of photographic identification used by marine field biologists, the emergent character of sociological knowledge can also be understood more clearly. That is, looking at how the development of this technique increased knowledge of cetacea, points to the importance of method and technique in the production of scientific knowledge. While learning about "other" sciences, social researchers have had, in the light of their studies, the opportunity to reflexively consider their own work and the nature and character of the production of sociological knowledge. As Shapin (1995) has noted:

> The sociology of scientific knowledge (SSK) is one of the profession's most marginal specialties, yet its objects of inquiry, its modes of inquiry, and certain of its findings have very substantial bearing upon the nature and scope of the sociological enterprise in general. (p.289)

What follows articulates the development of a scientific technique and the development of scientific knowledge based on extensive field research with marine field biologists.

Fieldwork with Field Scientists

My research is grounded within the sociology of science and scientific knowledge (see, for example, Clarke and Fujimura (eds.), 1992; Collins, 1983; Collins and Evans, 2002; Lynch, 1997; Maynard and Schaeffer, 2000, Mulkay, 1983, 1978, and Wajcman, 2002). It has been primarily devoted to the study of the everyday life-world of field scientists "doing science," especially the life-world of

marine field scientists studying cetacea in their "natural habitats." Within that context, I specifically focused on scientists who contributed to the emergence, development, and routine use of "photographic identification" of cetacea.

Data for this article are derived primarily from observing field scientists in their "natural settings." For more than two decades I have "observed" scientists in the "field," in their laboratories, onboard field research and commercial whale watch vessels. I have formally and informally interviewed more than sixty research scientists in these settings. Many of my interviews and observations of scientists were with those scientists who were/are involved with photographic identification of humpback and killer whales.

In addition, over the course of six years, I carried out a participant observation study of marine field scientists at a research laboratory in the Caribbean This involved living at the laboratory, participating in the day-to-day activities of scientists at the facility, as well as serving as a "dive buddy" and research assistant to several scientists and one doctoral student.

Further, I accompanied field scientists who were collecting data while they served as *tour guides or naturalists* on commercial whale watch cruises. My observations of scientists as tour guides or naturalists have substantially contributed to the content of and photographs in this article. My photographs are of humpback whales, the most aerobatic of cetacea.

By accompanying scientists serving as naturalists, I had access to parts of the ship that are not accessible to tourists. I was, thereby, in a position to observe most of the "back region" of the commercial whale watch cruise (Goffman, 1959). Being behind the scenes was often awkward because I was trying to be close enough to observe scientists at work while simultaneously trying to keep "my" distance in order to not get "in their way."

Eventually, I joined other passengers as a *fellow tourist* and observed the ways in which naturalists narrated the voyage whether or not the naturalist was a scientist. I spent two summer seasons, primarily on whale watch cruises based in New England cruises, taking notes and tape recording the narratives of the naturalists. I also used a video camera to record a whale's surface behaviors, as many tourists would. In this way, I was able to capture the naturalist's narrative while "shooting whales." It is partially by way of these narratives that the name and biographies of individual whales are publicly disclosed.

Shooting Whales

The past two decades have witnessed a phenomenal growth of interest in and concern for, as well as outrage over, environmental and ecological issues. One area of concern is the fate of marine mammals, especially cetacea. Cetacea (whales, dolphins and porpoises) have, ever since Flipper and Day of the Dolphin, captured the hearts, minds, and pocketbooks of individuals around the world. The bottle-nosed dolphin (Flipper), the humpback and killer whale (Free Willy), and near extinct species such as the North Atlantic Right Whale have attracted unprecedented public attention.

Media coverage of the beauty and plight of killer, humpback, and right whales has significantly contributed to the public attention bestowed on these marine mammals. Behavioral characteristics of different species, the songs of humpback whales, for example, contribute to both media and public attention. Aquaria displays of captured dolphins and killer whales have also aroused public concern and affection for these animals as well as stimulated conflict and controversy over the

ethics of maintaining these ocean roaming animals in confined quarters (see, e.g., Obee 1992). Commercial whale watch cruises, on the other hand, provide a somewhat more adventurous occasion for the public to observe cetacea in their natural habitat[i]. These occasions provide delightful photographic opportunities for (eco) tourists to permanently capture the inspiring aerial performances of cetacea.

The breath-taking photographic opportunities tourists enjoy are possible because of the behavioral predilections of cetacea. Humpback and killer whales present some of the more spectacular performances. Tourists, however, are not the only people who welcome such photographic opportunities. Scientists, as well, have been systematically photographing cetacea for more than three decades. Since the late 1960s, scientists have been observing cetacea in their natural habitat using the field technique of photographic identification. Photographic identification relies on the naturally occurring marks of an individual animal and uses photographs of these marks to individually identify an animal. For example, the underside of a humpback's fluke consists of a distinctive black and white configuration which can be used to identify an individual (see photos #1 and #2). As with human fingerprints, no two fluke patterns are identical. Researchers photograph these fluke patterns, which are visible when the whale raises its fluke in the air prior to a deep dive, and then use these fluke pattern photographs to build a catalog of individually identified animals.

Photo 1

Photo 2

An objective, permanent catalog of individually identified animals dramatically changed scientific knowledge of cetacea and the nature of cetacean research by enabling accessible, long-term biological studies of marine mammals. Photographic identification also facilitated the development of acoustic and DNA identification. Currently, then, both tourists and scientists are "out shooting whales," and often doing so together.

This article explicitly focuses on how the combination of photography and the natural markings and behavioral patterns of cetacea contributed to the development of the scientific field research technique of photographic identification, a technique which has facilitated an exponential growth of knowledge about cetacea. Implicitly, the article addresses the emergent relationship between intimacy with and knowledge about species that inhabit a very different environment than their human observers. It also provides an example of how a specific research technique produces a unique set of data. .

A confluence of factors

Jane Goodall's work is highly acclaimed for the data she has painstakingly accumulated on generations of chimpanzees. Her data are from observations made on terra firma. It is one thing to do long term research with land mammals that are visible and share the researcher's habitat. Clearly, it is a more trying experience to attempt long term research with marine mammals - mammals which spend 90 percent of their time under water and who routinely only show a small portion of their body above the water's surface. Rarely, and only fleetingly, does one get the opportunity to glimpse the "whole" animal above the water. While there are different strategies and problems in studying land and marine mammals, doing long-term, intensive behavioral studies of either requires an ability to recognise, reliably identify, and track individuals. Photographic identification of individual cetacea provides a method of tracking individual mammals through their life course and to trace, as in Goodall's studies, generational relationships.

The ability to identify and track individual cetacea using photographic identification (photo-id) depends upon an integrated set of conditions, conditions

which are either essential to or extremely useful for individual identification and subsequently long-term study.

Photographic Technology

Obviously, photographing a whale satisfactorily requires a photographic technology that can deliver a reasonably fast, optically accurate image using portable and relatively inexpensive equipment. Scientists in the late 1960s and early 1970s were fortunate to have a reasonably sophisticated photographic technology they could appropriate for their studies (cf. Becker 1982). Technological advances since those days have improved the scientists' task of accurately recording an image for identification purposes (see for example Daston and Galison, 1992). Although not necessary, it is helpful, for example, to have high-speed film and a camera with rapid automatic advance. But even the basic 35mm SLR cameras with (300 mm) telephoto lenses available in the early 1960s were technologically sufficient to help develop photo-id and usher in a new (and revolutionary) era of cetacean research[ii].

Durability and Reliability

Using photographic prints of natural markings for long-term field studies requires the ability to identify individuals through their life cycle. The correct identification of individuals over a period of years requires skilled researchers who must correctly match photographs of the same whale taken at different times and in different locations (Katona and Kraus 1979; Daston and Galison, 1992:93; Wajcman, 2002:353) and presupposes (as well as contributes to) knowledge about the object(s) of study. Daston and Galison (1992) observed a similar process in terms of medical x-rays:

> Precisely because of their conclusion that photographs did not carry a transparent meaning, the American Surgical Association unanimously counseled its members to use their medical knowledge and learn to read what might otherwise be misleading. (p. 112)

Further, “faith” in the viability of photo-id rests upon knowledge of the permanence of the morphological (shape of external body parts) and surface features (coloration or pigmentation patterns, scarring, etc.) used to identify individual whales. In turn, knowledge of these features rests upon the reliability of photographic identification. In the early stages of photo-id, scientists were unsure of the permanence of natural markings and, therefore, the viability of the technique for long-term studies. However, by routinely tracking individual whales at regular short-term intervals and painstakingly noting the degree and character of changes to specific natural markings (cf. Childerhouse and Dawson 1996), scientists began to be reasonably secure in their ability to correctly identify individuals, even with changes occurring to those features they focused upon. Scientists noted that although markings change, they normally change slowly and retain enough of the identifying characteristics needed for correct identification[iii]. By gradually expanding their knowledge about the morphological and surface features they were observing, scientists were developing a greater degree of security in relying on photo-id for long-term studies. Within a decade, photographic identification became established as a reliable technique for long-term field research of cetacea. And in establishing photo-id as a research tool, scientists were also able to enhance their knowledge of

morphological and surface feature attributes of cetacea. This dialectical process of scientific knowledge production, that is, the mutual evolution of scientific knowledge and research techniques, underscores the fundamental nature of scientific enquiry: that is, "science is a process of reducing the number of assumptions entailed in doing scientific research."[iv]

"I've got the camera, the lens, the film but what do I shoot?"

While morphological and surface features underpin photographic identification, other factors affect its viability. Species' behavior, population size and density, and habitat (open ocean or near shore) are equally important. Humpback whales, for example, are identified by the shape of their dorsal fin and the distinctive black and white color configuration of the underside and tattered trailing edge of their fluke[v]. While scientists use fin and fluke patterns in identifying humpbacks, these structures are also used because of the species-specific behaviors of these whales. When a humpback comes to the surface for a breath between dives, the shape and surface features of the dorsal fin are discernible, and in the initial stage of a deep dive, a humpback will begin its descent by arching its back (see photo #3).

Photo 3

Then, as it begins to glide down the water column, it will raise its fluke above the surface for a moment before it slips from view. If one is relatively close to and behind the whale, the underside (or ventral side) and trailing edge of its fluke will be visible. Photographs #1 - #5 show the distinctive features scientists use in photographically identifying individual whales. (Notice, particularly, the shape of the dorsal fin in photos #4 and #5: one is nearly hook shaped, the other is rounded with a distinctive white and black pigmentation pattern.)

Photo 4

Photo 5

Morphological and surface features in combination with breathing and diving patterns contribute to the viability of using particular body parts for identification purposes. In addition, the amount of time a whale spends at the surface, the location in which it can be found, the size of the pod or tribe it associates with, and the speed at which it swims are also important and must be taken into account in producing photographically identified animals. Thus, for example, while humpback whales are migrating thousands of miles between their winter calving areas in the Caribbean and their summer feeding grounds in New England waters, they are relatively close to shore and can be observed relatively easily. This is in contrast to Sperm Whales (*Moby Dick*) which are pelagic and may be, minimally, hundreds of miles off shore.

Humpbacks are also known to congregate in small groups, spend a fair amount of time at the surface, and move slowly enough to be readily observed.

Humpbacks: one feature not used in identification

A very distinctive feature of the humpback whale is its enormously long (up to 15 feet), brilliantly white flippers (see photos #6- #8). This morphologically unique feature can be seen when the whale is at the surface and holds its flippers underwater (see photo #6) or when it rolls on its side or back and lifts its flippers above the surface (see photos #7 and #8). When humpbacks roll in this manner, they often violently slap the water's surface with their flippers. Scientists could use the flipper as a naturally occurring marking for identification purposes.

Photo 6

Photo 7

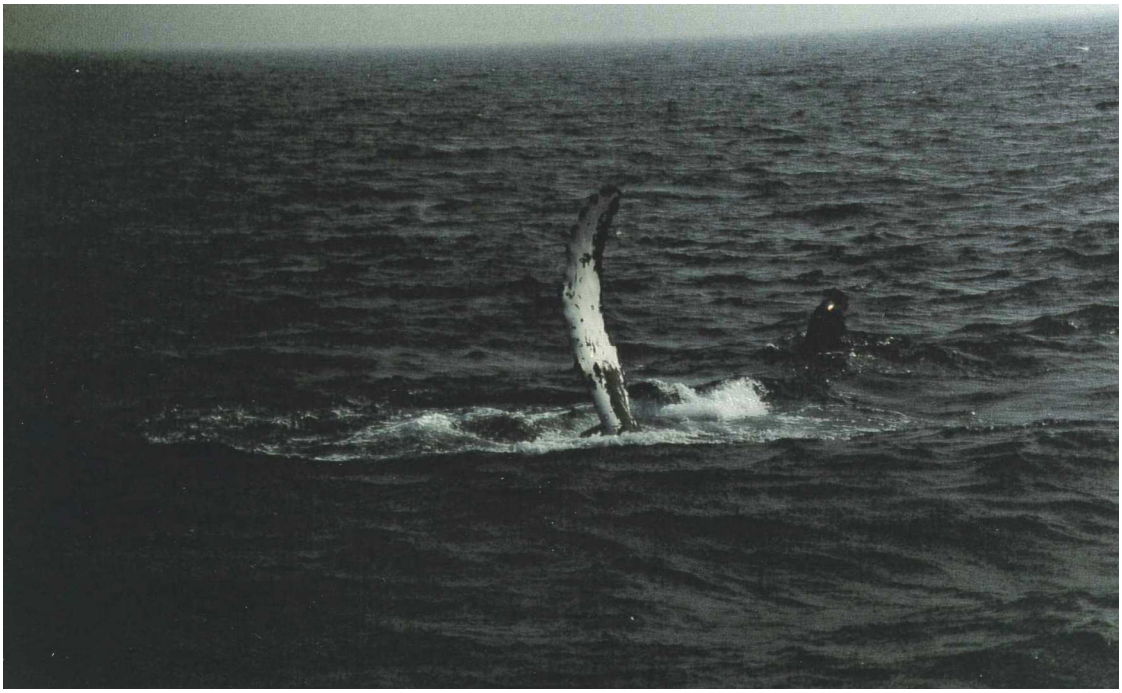

Photo 8

However, when the whale is at the surface with its flippers below the surface, even though they are visible, distortion from the water's reflected light makes positive identification virtually impossible (see photo #6). Further, scientists would have to be directly alongside and above the animal to get a good, clear photograph of its flippers. Getting such a photograph also requires an absolutely calm, flat water surface. Even if morphological and surface features could be used, photographing

the flippers when the animal displays them above the water's surface is logistically problematic in that flipper display is not as common an occurrence as the dorsal fin and fluke display. Thus, while there is no reason why the distinctive morphological and surface features of the humpback's flippers should not or could not be used for identification purposes, the whale's behavior and habitat features make the use of such features quite difficult. Having the humpback display its dorsal fin whenever it's at the surface and having a relatively good chance of seeing the fluke's underside is advantageous for scientists when scientists seek individual identification and long term behavioral studies.

Snapshots, naming, and objectification

Photographing a dorsal fin or fluke is only part of the identification process. The whale must also be catalogued, that is, given some assigned, unique, numeric identification code. While numeric coding is analytically sufficient for scientific research and analysis, whales may, nonetheless, be given names. There are at least two types of naming systems of which I am aware. Naming, as articulated by Ford, Ellis, and Balcomb (1997) and Ford and Ellis (1999) entails a letter and numeric code which includes the identification of an individual within a pod. Ford, Ellis and Balcomb (1997) noted:

> We developed our naming system during the course of our research. The plan was to assign the same letter to each whale within a pod and then to give each individual whale a number. The following is an historical account of the identification of the first pod, which will explain some of the system's idiosyncracies. The first whale recognized was called A1, and because she was so well marked her pod was called A1 pod. (p. 41)

In the case of North Atlantic humpbacks, in addition to a numeric code used to identify, catalogue, and track individual whales over their life course, these whales are also assigned, by acclamation of participating research scientists, gender neutral names at an annual naming ceremony[vi]. This is a very different relationship than that which Phillips (1994) observed with laboratory research animals where naming, if not scorned, was neither encouraged nor actively carried out.

What's in a Name?

Numeric identification is clear, precise, analytically necessary, and sufficient for research scientists to systematically collect and organize their data. However, numbered identification of individual body parts or individuals (and pod identification, as discussed above) are not the only, nor in some contexts, the best symbolic representations of the individual animal. A (proper) name is more engaging. For both the scientific researcher and the supporting public naming whales *subjectifies*. It brings life to an object (see Alia 1994). Indeed, naming creates an individual in ways that numeric identification of body parts cannot. It contributes to the construction of a "biography" that scientists and publics may use. This is contrary to what Phillips (1994) observed with laboratory animals----animals that remained nameless and without biography.

It is easier to think about and relate to an individual whale called "SHARK" than to think about a fluke or dorsal fin designated as identified whale 2744. A name immediately enables us to think of an individual, a unique individual with a biography.

It is an individual with a fluke, a dorsal fin, a mouth, a brain, and so forth. It is also an individual with "thoughts," feelings, idiosyncratic characteristics, and particular behavioral tendencies. It is not just "another pretty fluke." This can be compared to the laboratory animal that is "ontologically" different. Laboratory animals are thereby distinguished from "pets and wild animals" (Philips, 1994:134). It is this distinction as well that facilitates the treatment of the laboratory animal as an experimental object that is sacrificed as part of research and as part of its "laboratory life cycle" (Lynch 1988 and Phillips 1994).

One can then imagine Shark or Fracture doing something unique, where one has difficulty imagining a numbered body part used to identify the entire organism doing anything. On commercial whale watch cruises, for example, and especially where research scientists serve as naturalists, (see photo #9) scientists (naturalists) will note that "Shark is very active and curious - almost every sighting involved close approaches, tail slapping, or breaching"[vii]; or he/she might indicate that "Shark is called Shark because of its dorsal fin." And although this mark is not likely to be used for scientific identification purposes, nonetheless, it is descriptively memorable for scientists and publics alike – "a name is a truncated description" (Dewey and Bentley 1960: 292).

Photo 9

Furthermore, since scientists are often involved in conservation efforts[viii] requiring public support, naming enables the public to connect with these efforts through identification with a whale they have seen and come to know by name. For publics interested in conservation, numeric coding does not have the richness of texture that naming invokes. The "Adopt a Whale Program," organized by the Cetacean Research Unit of Gloucester, Mass., is designed specifically to help support both research and conservation work. For a small fee, the public (tourists) can feel they are simultaneously contributing to both scientific research and whale conservation and they contribute, in part, because of their identification with one or more named individual whales.

Indeed, tourists who regularly whale watch on commercial vessels might ask the naturalist a question such as: “How is Shark doing?” When asked in this form within the context of sighting named whales on a cruise, the tourist is indicating that “Shark” is a whale remembered from a previous trip. Their question is meant to inform the naturalist and anyone else in hearing range that: “Hey, I am not new to this scene; I know about these whales. I am not just another day tripping, whale watching, tourist out for the eco-experience; I am, after all, serious about conservation, whales, and science.”

Naming and identifying whales in the manner described above and under the conditions of the scientist as naturalist, collecting data in the presence of tourists and supporting publics, suggests a symbiotic relationship between tourism and science (see for example, Davis, 1997), between the tourists and the scientist which enables both to get the “shot” each wants[ix] (see photos #9 and #10).

Photo 10

Naming, Biography and Anthropomorphism

Commonly used names of species can have an anthropocentric character. For example, the humpback whale (whose scientific name is Megaptera novaeangliae) has different names in different languages. Unwittingly, these names may entail the imputation of human characteristics----characteristics which may not be shared by the species so named. For example, “*vessyl kit* (is) a Russian name meaning ‘merry whale’” (Clapham, 1994:4).

On the other hand, I have noted above two different methods scientists use in “naming” wild animals, animals “used” as research subjects by marine field biologists. One “alpha-numeric” name method was used in the field studies of Orcas. Another method used with humpback whales extends the numeric identification scientists use as a referent but also included gender neutral names, such as SHARK.

These names, while gender neutral, are not randomly assigned to an individual whale. Usually there is something about the unique characteristics of a whale that prompts scientists to agree to one name over another; something about the whale that is indicative of the whale.

In assigning names, as mentioned, the construction of the named animal's biography is directly and indirectly acknowledged and anticipated. While scientists are sensitive to and critical of anthropomorphizing, that may engage in such practices, nonetheless. For example, a researcher's photo caption (Flukeprints, 1994: 4) about a whale named Zeppelin noted she "…was often an active 4-year old, entertaining many whale watchers with breach displays or close *inquisitive* approaches (italics added)."

It may be argued, however, that working as a behavioral field research scientist implicitly promotes anthropomorphizing on the part of these researchers. That is, unlike what Phillips (1994) reports about the absence of naming animals due to the structure of laboratory research, it is, indeed, the nature, structure, and conditions of field research that encourages naming, identifying, and constructing a biography that may well contribute to a "new anthropomorphism" (see, Kennedy, 1992). Laboratory animals have no name and no biography. Thus, they are not individually named and identified (Phillips, 1994). It is the very opposite case with cetacean researchers. For their research purposes, they need to identify individuals by name and construct an individually identified whale's biography. It is necessary to do this in order for them to carry out long term research into the social structure and biology of the species. Further, they need to spend an inordinate amount of time in painstaking observation to fulfill these tasks and to understand the "meaning" of and an explanation for the behaviors they observed.

In this regard, researcher and commercial whale watch naturalist, Dr. Mason Weinrich reflexively notes (1987):

> While we do maintain scientific objectivity in data analyses and conclusions, it is difficult not to become attached to the animals with which we spend so much of our lives. These feelings surfaced, recently, when one of our well-known animals, Beltane, washed ashore dead. I offer this article to let you, the reader, know something about what we leaned from following a single animal and, moreover, to show a humane aspect of what is often viewed as insensitive, objective science. (p. 3)

In addition, we have noted that field research scientists may engage in a number of extra scientific practices, that is, conservation work and/or serving as naturalists with commercial whale watch companies. Under these social conditions of doing research, scientists may vividly experience tension between the demands of objective scientific work, the nature and structure of carrying out long term behavioral field studies, and the interests and demands of the tourist industry.

Discussion: Identification and knowledge

Although I have mentioned other species of cetacea in my discussion of photographic identification, I have focused on humpback whales for illustrative purposes. Humpbacks are quite accessible for long term study in the North Atlantic and were, along with killer whales, two of the initial species to be photographically identified. Indeed, the killer whales of British Columbia and the humpbacks of the Gulf of Maine are two of the most systematically studied whale populations in the world. Knowledge about these populations is possible because of photographic

identification. Through the use of this relatively simple field technique, scientists are beginning to piece together the biological and behavioral nature of cetacea about which they had little knowledge prior to photographic identification. As Weinrich noted (1987):

> The past fifteen years have seen a major change in the nature of whale research. While most research was conducted using the carcasses of dead whales before the 1970s, attention is now primarily dedicated to non-lethal studies of population biology, ecology, behavior, social structure, and other related topics. (p. 3)

Thus, a change in the method of observation can usher in a change of research practices that facilitate both observational opportunities and revolutionary discoveries. There are several exciting examples one can mention of what scientists have learned using photo-identification, knowledge that was unlikely to have been discovered had photo-id not been part of their research repertoire. Research scientists studying killer whales off the British Columbia coast, for example, soon discovered with the use of photographic identification that these whales live in either "resident" or "transient" communities. Although the territorial ranges may overlap, each community has a distinct territorial range, and each community displays a different behavioral pattern[x]. In addition, one of the major social insights derived from long-term, photo-id studies of killer whales is that they live in matrilineal societies. This is especially significant in that male killer whales are much larger than females, and being larger is usually associated with domination. Female killer whales, at least off BC, dominate the consciousness and behavior of pods.

Another discovery derived from photo-id with killer whales was the development of acoustic identification, pioneered by John Ford (see e.g. Ford, Ellis, and Balcomb, 1997: 21-22 and Ford, 1985). Through his efforts, scientists learned of different dialects of BC killer whale pods, even though these pods are in proximity to each other and have overlapping territories. In other words, each pod has its own voice.

Photo-id based research on humpback whales has also produced some intriguing results. One of the first delightful research results that I learned about was migration patterns. Prior to the use of photo-id with humpback whales, scientists were aware of migratory patterns between northern feeding grounds off Alaska and calving areas along the western coasts of Hawaii, Mexico, and South America. Scientists believed that this migration pattern was simply that the same whales regularly moved to the same location each migration season. However, by identifying individuals, through the use of photo-id, scientists learned that the pattern of migration was more irregular. The same whale might spend one or more seasons in Hawaii and be observed in Mexico or South America another season.

As a result of being able to track individuals, scientists not only learned that humpbacks produced "songs" but that each season humpbacks would modify their tunes. They sang the same basic song, but also produced variations of the song each year. What this means exactly is unclear. However, to be secure in knowing that whale songs change requires that one be able to reliably identify individuals over the long term.

Concluding comments

The use of photography and naturally occurring marks to distinguish, record, and follow individual cetacea enabled scientists to pursue research in a manner

consistent with their quest for relatively inexpensive, non-intrusive, long-term field studies of cetacea in their natural habitats. The use of photographic identification dramatically changed what scientists, as well as the public, know about cetacea. Furthermore, the development of photo-id as a reliable field technique enabled new techniques, such as DNA typing and acoustic identification, to become viable field techniques. Both DNA and acoustic techniques have further contributed to the knowledge about cetacea now amassing.

As photographic identification of cetacea changed cetacean research and opened windows to knowledge of cetacea for research scientists and informed publics alike, a study of the development of this technique opens windows to our sociological understanding of the interdependence of research technique, species' characteristics, and the development of scientific knowledge. What we know often is influenced by how we observe, and developing and refining our techniques of research may lead to a greater understanding of our world.

Reflecting on the nature, structure, and conditions of marine field research may raise an interesting set of challenges for sociological researchers within the contexts of qualitative sociology, sociological non-human animal studies (Arluke, 2002 and Kruse, 2002) and particularly qualitative research within the context of sociology of science and scientific knowledge. This may be especially witnessed when we compare sociological studies of scientists at work within the structure of a research laboratory to scientists at work within the context of biological *field* research. Indeed, it appears that long term behavioral studies of non-human animals may require specific forms of research techniques familiar to qualitative sociologists.

In addition, it is the case that attempting to understand the social dynamic, the social structure, of non-human species entails long hours, indeed, years of painstaking time dedicated to this understanding. Field biologists seem to be more aware of this than many of my sociological colleagues. Dr. Michael Bigg, a pioneer and leader in the field of photographic identification and field studies of Orca using photo-id humbly commented, after I had suggested to him that he write a book detailing his more than 15 years of field research with Orca, “I just don’t know enough.” Similarly, Nico Tinbergen’s herring gull study entailed more than a decade of dedicated research. If ethologists such as Tinbergen and biologists such as Bigg recognize the need for long term study, might not qualitative sociological researchers also recognize the need to spend more time doing field work in attempts to understand the rich textured social dynamics of human animals?

Perhaps the most important lesson to learn from a study of photographic identification of cetacea is that it was the emergence and development of a particular technique that facilitated long term field studies which, in turn, enabled the amassing of knowledge about cetacea. The use of and results from this technique supported other relevant technological developments as tools for field researchers which further enhanced the creation and development of scientific knowledge. Indeed, as one physical oceanographer causally reminded me “since the 19th century, science has been technique driven.”

While I have mentioned that it is the social structure, research conditions, and research goals that, in part, influence a scientist’s relationship to his/her animal subjects, be that in the laboratory as Phillips indicated (1994) or in field research as I (Nutch, 1996) and others (cf, McKegney, 1980, Roth and Bowen, 1999 and Scarce, 2000) have investigated, there is an absolute dearth of qualitative field studies of field sciences and field scientists (see Nutch, 1996) . There may, however, be a more general disinterest and unattractiveness in pursuing any sociological studies of science, be that within the context of laboratory or field sciences. Shapin, (1995) has noted:

> The sociological study of science makes demands upon initiates which all but a handful find difficult to fulfill. Despite the continuing scientistic bent of North American sociology, few students come equipped with relevant competences in the natural sciences. There is a widespread, and partly justified, sense that SSK (*Sociology of Scientific Knowledge*) is 'hard,'and students searching for a secure career-track are encouraged to look elsewhere. (p. 293)

Students of SSK, however, may find that pursuing sociological field work of behavioral biological research is far more accessible and, thereby, more attractive to study than other branches of scientific investigations. If they do take up this challenge, it may serve to accomplish two things; mitigate what Shapin argues and simultaneously increase our understanding of the practices, structures and contexts of field science.

Nonetheless, in terms of contemporary studies of science which are primarily based in studies of laboratory sciences, it would be imperative for qualitative sociologists of science to ask themselves, "whose science are we talking about when we talk about science"?

Endnotes

i Commercial whale watch cruises are also a subject of controversy. There is concern over the noise disturbances to cetacea and likely harassment as these ships attempt to give tourists great photo opportunities (cf. Baker, Perry, and Vequist 1988: 14-15).

ii Michael Bigg, field scientist and early developer of photographic identification of killer whales in the coastal waters of British Columbia, has commented on the specific equipment and procedures in photographing cetacea for identification purposes. He notes, for example, the use of a 35 mm SLR camera with through-the-lens light meter, with shutter speeds of at least 1/1,000 of a second, 180-300 mm lenses, and Kodak Tri X film, etc. (Bigg et al., 1986:10).

iii While "naturally occurring markings" are used in photographic identification research, scientist Michael Bigg surgically notched the trailing edge of the dorsal fin of a killer whale to test the reliability of using photographic identification based on visible surface and morphological features of killer whales. Bigg photographically recorded the changes to these notches over a period of eight years. While the shape of these notches changed, the animal was still readily identified by these notches. (Bigg 1983)

iv Paraphrasing a comment made to me in conversation with research scientist Michael Bigg.

v Scientists from the Cetacean Research Unit (CRU) in Gloucester, Massachusetts, are currently establishing the viability of using the "knuckles" aft of the dorsal fin of humpback whales (see photo #3) as a naturally occurring feature that will enhance the reliability of individual identification. CRU's research is yet to be published, and the above statement is derived from my conversations with research scientists at CRU who are working on this latest "technique refinement."

vi I first learned of this naming ceremony while interviewing a leading North American cetologist. There is an annual meeting in which research scientists

get together to vote on naming a discovered individual who has no name. Often some characteristic of the whale is the basis for a name. There is a toast between naming, and according to my interviewee, names fly more freely toward the end of the evening. Here is a sample of names listed in Flukeprints, 1995 (March - April):2: Agasiz, Chablis, Double-O, Hornbill, Newton, Raven, Squiggle, and Zeppelin.

vii This comment was taken from a caption under a fluke photograph of Shark in the Cetacean Research Unit's publication Flukeprints 1995 (March - April):4)

viii Ironically, while many researchers are involved in conservation efforts to help recover cetacean populations, the smaller the population size, the more often viable field techniques such as photographic identification are meaningfully employed.

ix This is especially the case in the New England region. Many research institutes rely on commercial whale watch cruises to facilitate data collection. Scientists will serve as naturalists and narrate the cruise while simultaneously collecting data. While this exchange is an economic opportunity, it does have its downside. There is an uneasy fellowship in this exchange. Scientists, commercial carriers, and tourists, while sharing an interest in the opportunity to observe whales in their natural habitat, do not necessarily share the view of what this observational opportunity should be. Often there are contradictory interests and normally, by satisfying the desires of tourists and commercial enterprises, basic scientific interests are compromised. In addition, Rik Scarce (2000) has detailed a similar process regarding West Coast salmon fisheries, where basic scientific questions regarding salmon are suppressed under the political sway of managerial and sports arenas. In general, both in whale watching and salmon fishing, when commercial, tourist, and scientific worlds intersect, basic science will likely be compromised.

x Recently there has been the discovery of a third community labeled “offshore” (see Obee 1996). My thanks to Kate Paul for informing me of this recent discovery and to Professor J. Conley for calling my attention to the Obee article.

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References

Alia, Valerie (1994) *Names, Numbers, and Northern Policy*. Halifax: Fernwood Publishing.

Baker, C. Scott, Anjanette Perry and Gary Vequist (1988) “Humpback Whales of Glacier Bay, Alaska.” *Whalewatcher* 22(3):13-17.

Becker, Howard (1982) *Art Worlds*. Berkeley: University of California Press.

Bigg, Michael A, Graeme M. Ellis and Kenneth C. Balcomb (1986) "The Photographic Identification of Individual Cetaceans." *Whalewatcher* 20(2): 10-12.

Bigg, Michael, Ian MacAskie and Graeme Ellis (1983) "Photo-Identification of Individual Killer Whales." *Whalewatcher* 17(3): 3-5.

Childerhouse, John, and S.M. Dawson (1996) "Stability of Fluke Marks used in Individual Photo Identification of Male Sperm Whales at Kaikoura, New Zealand." *Marine Mammal Science* 12(3): 447-451.

Clapham, Phil (1994) "What's in a Name?" *Coastwatch* 3(May/June): 4.

Clarke, Adele E. and Joan H. Fujimura, editors (1992) *The Right Tools for the Job: At work in Twentieth-Century Life Sciences*. Princeton: Princeton University Press.

Collins, H.M. (1983) "The Sociology of Scientific Knowledge: Studies of Contemporary Science." *Annual Review of Sociology* 9:265-285.

Collins, H.M. and Robert Evans (2002) "The Third Wave of Science Studies: Studies of Expertise and Experience." *Social Studies of Science* 32(2): 235-296.

Daston, Lorraine and Peter Galison (1992) "The Image of Objectivity." *Representations* 40 (Autumn): 81-128.

Davis, Susan G. (1997) *Spectacular Nature: Corporate Culture and the Sea World Experience*. Berkeley: University of California Press.

Dewey, John and Arthur F. Bentley (1960) *Knowing and the Known*. Boston: Beacon Press.

Flukeprints (1995) April – March. Gloucester, Massachusetts.

------. (1994) April - March. Gloucester, Massachusetts.

Ford, John K. (1985) "Acoustic traditions of killer whales." *Whalewatcher* 19(3): 3-6.

Ford, John K.B., Graeme M. Ellis and Kenneth C. Balcomb (1997) *Killer Whales*. Vancouver: University of British Columbia Press.

Fujimura, Joan (1987) "Constructing 'Do-able' Problems in Cancer Research: Articulating alignment." *Social Studies of Science* 17:257-293.

Goffman, Erving (1959) *The Presentation of Self in Everyday Life*. Garden City, NY: Anchor Books.

Katona, Steven and Scott Kraus (1979) "Photographic Identification of Individual Humpback Whales (Megaptera novaeangliae): Evaluation and Analysis of the Technique." Report No.MMC-77/17, Marine Mammal Commission, Washington, D.C.

Kennedy, John S. (1992) *The New Anthropomorphism*. Cambridge: Cambridge University Press.

Knorr-Cetina, Karin D. (1983) "New developments in science studies: The ethnographic challenge." *Canadian Journal of Sociology* 8: 153-177.

Latour, Bruno and Steven Woolgar (1986) *Laboratory life: The construction of scientific facts*. Princeton, NJ: Princeton University Press.

Lynch, Michael (1997) *Scientific practice and ordinary action: Ethnomethodology and social studies of science*. Cambridge: Cambridge University Press.

------. (1985) *Art and Artifact in Laboratory Science: A study of shop talk and shop talk in a Research Laboratory*. London: Routledge and Kegan Paul.

Maynard, Douglas W. and Nora Cate Schaeffer (2000) "Toward a Sociology of Social Scientific Knowledge." *Social Studies of Science* 30 (3): 323-370.

Mulkay, Michael (1983) *Science and the Sociology of Knowledge*. London: George Allen and Unwin.

------. (1978) "Consensus in Science." *Social Science Information* 17(1):107-122.

Nutch, Frank (1996) "Gadgets, Gizmos, and Instruments: Science for the Tinkering." *Science, Technology, and Human Values* 2 (Spring):214-228.

Obee, Bruce (1996) "Mysterious Orcas." *Beautiful British Columbia* 38 (3): 14-21.

------. (1992) "The Great Killer Whale Debate: Should Captive Orcas Be Set Free" *Canadian Geographic* 112 (1):20-31.

Phillips, Mary T. (1994) "Proper Names and the Social Construction of Biography: The Negative Case of Laboratory Animals." *Qualitative Sociology* 17 (2):119-142.

Roth, Wolff-Michael and G. Michael Bowen (2001) "Creative Solution and Fibbing Results: Enculturation in Field Ecology." *Social Studies of Science* 31 (4): 533-556.

------. (1999) "Digitizing Lizards: The Topology of 'Vision' in Ecological Fieldwork." *Social Studies of Science* 29 (5):719-764.

Scarce, Rik (2000) *Fishy Business: Salmon, biology, and the social construction of nature*. Philadelphia: Temple University Press.

Strauss, Anselm L. (1969) *Mirrors and Masks*. The Sociology Press.

Wajcman, Judy (2002) "Addressing Technological Change: The Challenge to Social Theory." *Current Sociology* 50 (3): 347-363.

Zenzen, Michael and Sal Restivo (1982) "The mysterious morphology of immiscible liquids: A study of scientific practice." *Social Science Information* 21: 447-473.

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