CONSIDERING MIGRATION AND ITS EFFECTS ON COASTAL ECOSYSTEMS

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1. INTRODUCTION

For decades people have tried to understand and define the relationships between population growth and migration, consumption, and environmental condition. Early simplistic formulas claiming a linear relationship between population size and environmental degradation have been shown to be deficient, especially when nuances of demographics such as migration and factors driving and organizing human behavior are not taken into account. Discarding outdated paradigms has not immediately led to the development of new ones that can easily explain the relationship between human population and environment, however. Yet much recent research has moved us towards elaborating the elements that will compose the foundation for a new paradigm. We describe some of these foundational elements from the perspective of migration scholars and with some attention to the research and theory of common property resource management scholars.

While we are far from a conceptual framework that adequately incorporates all the variables in such complex relationships between humans and nature, there are common threads in the way researchers have addressed these questions. We believe that there is a timely convergence of ideas and demand for empirical evidence for understanding the relationship between population size, migration, consumption and the health and productivity of ecosystems. Much of this convergence has focused on coastal ecosystems: some of the most complicated, and increasingly most stressed, global environments. In this paper we explore a limited set of theoretical pathways from which hypotheses might be derived about the positive and negative impacts of population growth and migration upon the environment. We focus upon migration, in particular, since it is an understudied phenomenon in coastal areas, but the largest contributor to population growth in coastal areas (Cohen and Smial 1998). We suggest three critical questions that need to be answered in order to link migration processes to coastal ecosystem health: 1) Who migrates? 2) How are they received in the place of destination? 3) And, do they maintain ties to their place of origin? In the
parlance of migration scholars these concerns are migrant selectivity and migrant social networks. Recent theorizing and empirical evidence from migration scholars implicates embedded relations as critical for understanding both selectivity and the role of social networks. Embedded relations also emerge as a key concept in the literature about coastal ecosystems, marine resources, and fisheries management. We present a synthesis of the migration literature and the coastal and marine management literature and use recent research from coastal ecosystems to promote measurement, methods, and modeling approaches for refining our understanding of the possible impact of population, particularly migration, upon coastal ecosystems.

Among the world's many biomes, coastal zones perhaps the areas most subject to rapidly changing demographics and environments. The broad band of continental coastal areas, and small islands in their entirety, provide the best alluvial soils for agriculture, good opportunities for transport and waste disposal, access to fisheries (and increasingly, access to lands near-shore areas suitable for aquaculture), and space deemed valuable for recreational use and housing. Population doubling rates are almost uniformly higher in the world's coastal zones than in inland areas. At the same time, environmental change in coastal areas is dramatic - sometimes haphazardly - and rapidly under ambitious development schemes and at other times happening more slowly as impacts on the coastal environment cumulate. With many anthropogenic impacts and natural changes occurring simultaneously in coastal zones, and with inadequately integrated coastal management being the norm throughout the world, the need to assess the complex human and natural environment of the coasts is great. Thus coastal areas and their inhabitants present the greatest challenge for investigators examining the population/environment nexus - and are the regions where learning about the relationship between humans and environment is most urgently needed.

One of the weakest points in empirical studies tying together demographic analysis and ecological assessment has been the omission of how social networks and embedded relations evolve and relate to human behaviors and the physical environment (Curran 2002). A new paradigm to replace Malthusian ideas of population will not arise until we develop better understanding of human behavior and the drivers behind such behavior, particularly how human behaviors are organized and provided. We must assume that the social relations defining natural resource use by people (consumption, exploitation, management, investment) is a critical intervening variable between population growth, migration and environmental outcomes. The set of social relations defining natural resource use are described in environmental literature generally as property relations, which can vary from open access, to common property (with varying degrees of local and state participation), and to private or market-based relations (Ostrom 1998). We discuss these social relations, and what we have begun to learn about them in coastal areas, in the following pages.

2. PARAMETERS OF HUMAN POPULATION DYNAMICS AND ENVIRONMENTAL CHANGE IN COASTAL ECOSYSTEMS

Myriad studies have addressed one aspect or another of human populations and behavior in coastal communities, from small rural villages to large urban areas. Similarly, the last three decades have witnessed a proliferation of studies that assess the current condition and trends in environmental health and productivity of coastal ecosystems, both terrestrial and nearshore marine. Relatively little research has attempted to uncover correlations between population changes and environmental conditions in coastal ecosystems, and even fewer have explored the causality behind correlations that are revealed (Dietz and Rosa 1994). Although a large literature exists concerning coastal zone management issues (e.g. Clark, 1996; Reddile et al., 1988), quantitative analysis of coastal environmental changes in this literature tends to focus almost exclusively on environmental deterioration of the terrestrial portions of the coastal zone, not the marine. Furthermore, policy prescriptions such as those suggested in the Noordwijk Guidelines (World Bank, 1993) have been based on general overviews of human impacts in the coastal zone, and not on-site-specific empirical studies, nor an understanding of the demographic and other drivers behind observed or expected impacts. Nonetheless, a critical mass of studies now exists to allow us to begin to develop a conceptual framework for revealing the relationship between demographics and environment in the coastal zone.

Parameters that sociologists and anthropologists quantify in these important interdisciplinary studies are far too numerous to list comprehensively here. Some of the more important data upon which empirical studies are based include population size and doubling rate, fertility, immigration and emigration, population age structure, and information about education, health, employment, etc. Social scientists also assess consumption, and both household- and market-driven demand (Princen 1999). At the gross level much of this data can be obtained through government census and other records, though the best studies attempt to ground truth census data with more nuanced interpretations of aggregate census figures. Many population researchers also attempt to assess the collective behavior of individuals, through time scale household studies, and rapid rural appraisal. At the same time, social scientists analyze issues of management and governance that influence human behavior and community
development (Bavink 2001). Comprehensive investigations of population dynamics then attempt to bridge these various scales, and to uncover drivers behind population changes that are, or have been, taking place (Jolly and Torrey 1993; World Resources Institute 2001).

On the environmental side of the equation, the kinds of parameters that are the focus of interdisciplinarity population/environment research are those that give indication of environmental quality (water quality, erosion rates, presence of algal blooms, etc.) or levels of productivity (biomass estimates, levels of resource, phytoplankton production, mangrove forest coverage and density, etc.). Sophisticated new Geographic Information Systems (GIS) models are also being employed to display historical trends in land and/or coastal ocean use and environmental conditions, and even to allow predictive modeling of future conditions (Yi Bryant, Bryce, McKinstry, and Spalding 1998; Australian Institute of Marine Science 2001). Since marine environments are notoriously difficult to study, scientists often use proxies for productivity such as catch per unit effort and catch per unit area of a target fishery. Bio-indicators are increasingly being used to show changes in ecosystem condition, including situations when ecosystems change at dramatic rates to alternative states (known as phase shifts). Human health in coastal communities is also sometimes used as a proxy for changes in coastal environments, but only in cases where causation between pathos and environmental degradation can be confirmed (e.g. incidence of E. coli related sickness in babies).

Correlating population and ecological data is not meaningful unless two conditions are met: 1) the parameters being investigated are the correct choices for accurately assessing the human and environmental conditions, and 2) the causal factors driving changes in human behavior and ecosystem function are revealed. For instance, not all environmental changes are indicative of a decline in environmental health or decreased productivity (from the perspective of human beings). Investigators are not spending significant effort in assessing these two primary conditions, although their approaches show a wide diversity in the tools used for assessment, scales of study, and models of analysis. Most are also careful to avoid basing empirical analysis on variables with inherent endogeneity. The diversity of approaches and the care taken to identify meaningful dependent and independent variables confers robustness to this interdisciplinary field of study, and suggests that the development of an entirely new paradigm to replace the Malthusian model is long over.

As we have come to shed the old Malthusian paradigm that population growth leads to environmental decline (neatly summarized by the IPAT equation, a shorthand for a multiplicative model, Environmental Impact = Population*Affluence*Technology), we have begun to learn that the interplay between humans and environment is a complex, non-linear relationship characterized by positive and negative feedback loops. Based on studies of developing and developed country demographics, it is clear that accelerated growth of human populations in coastal areas does not in and of itself explain the trend towards degraded coastal environments and degraded ecosystem health. More important are shifts in collective human behavior brought about by erosion of traditional management practices and tenure or other property rights, unchecked competition for increasingly scarce resources, and creation of subsidies or other, usually central government-led incentives to increase consumption of coastal resources. Patterns of in-migration into coastal areas are far more critical a factor in assessing population-environment links than absolute population size, primarily because of the selectivity of migrant flows and because existing social networks and embedded social relations in coastal communities are often upset by influxes of non-indigenous peoples with differing customs, technologies, and levels of investment in resource management. For this reason, we focus this paper on migration, its influence upon social networks and embedded social relations as they each relate to resulting environmental changes.

Migration has been described as "an extremely varied and complex manifestation and component of equally complex economic, social, cultural, demographic, and political processes operating at the local, regional, national, and international levels..." (Castles and Miller 1993). As complex as migration is, the environment is equally so. And it is similarly problematic to remove environmental processes from the social, economic, political and institutional structures of which they are a part (Blössner and Carr 2000). Therefore, drawing a linear, deterministic relationship between environmental degradation and migration is inappropriate and impossible (Zaba and Clarke 1994; Lougheed 1998). The current preoccupation in the literature is to conceptualize the relationship as complex system racist complex system demanding longitudinal and multilevel approaches (Marquette and Blössner 1999; Marquette and Blössner 1997; Zaba and Clarke 1994). And several empirical case studies make evident support for this perspective (Sunderlin and Resosudarmo 1999; Burns, Kick, and Davis 1998; Silberman and King 1999).

3. UNRAVELING MIGRATION AND ITS EFFECTS ON THE COASTAL ENVIRONMENT

The current theoretical paradigm dominating the migration and environment literature modifies a long-held demographic theory, multi-phase response (Davis 1963). The modification of multi-phase response theory specifies that social relations and behavioral responses modify how population growth impacts environmental outcomes, specifically land-use...
practices (Bilsborrow and Ogendo 1992). The theory postulates that population growth affects land-use change through four stages, which can be consecutive, concurrent, or cumulative. These four stages are tenure regime change, appropriation of land (extensive deforestation), technological innovation, and demographic (out-migration) (Bilsborrow and Ogendo 1992).

This multi-phasic explanation for understanding the effect of population growth upon land-use change made important theoretical advances for many scholars in the field. However, it underestimates the complexity and heterogeneity of migration flows and the varying forms of migration — return, repeat, circular, permanent, and temporary — the selectivity of migration, and how social networks and embedded relations may be important intervening variables for understanding migration impacts upon the environment. Despite these limitations, the empirical research that builds on this original theory has begun to clarify the relationship through the recognition of four dimensions of the migration process: selectivity, origin, destination differences, remittances, and social institutions (Curran 2002).

Summarizing the findings from the empirical literature shows that the selective nature of migration has an impact on environmental outcomes, including variability in the type of migration. Also, environmental considerations at both places of origin and destination can serve as push or pull factors respectively. Further, remittances back to places of origin may play an important role in redirecting consumption in either positive or negative ways for environmental outcomes. Finally, migration affects the environment through social and economic institutions, such as land tenure and poverty (Curran 2002).

The preceding summary of findings in the migration and environment literature suggests that the causes and consequences of migration — whether they are environmental or not — researchers must examine the selection processes that include or exclude particular people from becoming migrants. The second question addresses recent theoretical concepts of social networks and embedded relationships, which can be used to generate hypotheses that predict positive or negative environmental outcomes in a given context or system of property relations.

In this section of the paper, we elaborate upon these two questions and use examples from recent studies of coastal and mangrove systems to demonstrate how selectivity and social networks might mediate the impact of migration upon ecosystem health. First, we explain what is meant by migrant selectivity and use examples from the Galapagos, Ecuador and Goa, India to demonstrate how selectivity might affect environmental outcomes. We then elaborate upon the second question by discussing three literatures: migration and social networks, common property resource management, and migrant assimilation. In all of these literatures social networks and embedded social relations are critical conceptual tools for understanding the distribution of environmental outcomes and, third, we use four case studies to demonstrate how the importance of social networks for understanding migration effects for ecosystem health.

3.1 Migrant Selectivity and Environmental Outcomes

One way in which the literature on migrant selectivity has attempted to show the variability of migrant impacts upon the environment is to compare spontaneous versus forced migration. The findings show varying results. In some cases, spontaneous migrants appeared to cause greater destruction of the environment than forced migrants. In Indonesia, spontaneous migrants were associated with rates of deforestation twice those of the transmigrants (Bilsborrow and Ogendo 1992). In other cases, forced migration is worse for environmental outcomes in places of destination than is spontaneous migration. In Mexico, resettlement schemes of the 1960s and 1970s led to extensive deforestation (Alcorn and Toledo 1998; DeWalt and Rees 1994; Ewel and Pol boa 1980). In the case of the Mexican tropical rainforest, in fact, spontaneous migrants adopted local management practices (Alcorn and Toledo 1998). In Zimbabwe, migrants recruited through government programs were not interested in farming and did not invest in sustainable land use practices (Meltosh 1993).

Another way in which the literature on migrant selectivity has demonstrated differential impacts is to examine the impact of return migrants upon environmental consumption and valuation in places of origin. For example, young return migrants to rural places in Ecuador have a lower impact on deforestation than do new migrants, although Bilsborrow (1992) does not specify a reason. In other instances, return migrants, especially if they are professionals or gained professional training while migrating, return to places of origin with a different valuation of ecosystem services and commitment to preserving the environment (Conway and Lohal 1995).
the ease of the Caribbean islands, Conway and Lohra (1995) find that return
migrants invest in the establishment of local NGOs for the protection of the
environment. In another study of the Caribbean, return migrants invested in
secure land holdings and proceeded to invest in long-term, sustainable agro-
forestry projects (Thomas-Hope 1999).

Most of the research on migration and the environment does not consider
measurement of migrant selectivity in the traditional ways in which migrant
selectivity is considered to age, life course stage, sex, or human capital.
Given that migrants have not been considered in regards to how variability in
migrant stream composition might imply different environmental outcomes.
Further, these selectivity issues can also be considered in relation to both
origin and destination environmental outcomes, especially as these factors
will differentially interact with the social institutions governing ecosystem
management.

Two recent case studies illustrate the importance of understanding
migrant selectivity issues in relation to environmental resource exploitation
in marine and coastal ecosystems. In the case of the Galapagos, the
selectivity must be inferred, but the description of the case reveals questions
about who migrates and what type of migration they employ. Although
the Galapagos Islands are world renowned for their unique flora, fauna and
world heritage status, they also represent economic opportunity to many
Ecuadorians, particularly poor fishers living along the South American coast
(Bremer, Perez, and Borrja forthcoming). The most recent marine resource
to come under extraction pressure is the sea cucumber (Holothuria sp).
Resource extraction has been largely undertaken by migrants, and
individual migration has led to family migration and more permanent
residence.

The young men migrating to harvest sea cucumbers come from particular
communities along the Ecuadorian mainland coast where they became
experienced in sea cucumber harvesting methods. Through their connection
to Asian trading networks (the market for sea cucumbers is primarily in
Japan and China) they became familiar with harvesting, technology, and
knowledge, they were able to completely diminish the sea cucumber
population along the mainland coast. Following their Asian beneficiaries
they were then able to locate a new population of sea cucumbers on the
Galapagos Islands. The Galapagos Islands had important demonstration effects upon the local fishers. Soon most fishers (part time or full
time) were participating in the extraction of sea cucumbers until
harvesting was closed by the Ecuadorian government between 1992 and
1994. Since then the harvesting season has only periodically opened for very
limited time periods (Bremer et al. forthcoming), but each time more and
more fishers participate in the harvest and the catch per unit effort has
decreased dramatically from the end of the season and across
years.

This example shows how migrant selectivity is important for the way the
resource base is exploited in a destination. The particular environmental
resource draws a particular type of person to a locale. In the case of the
Galapagos Islands, the sea cucumbers attracted young male migrants. More
specifically, it is young male migrants with particular human (fishing skills),
financial (Asian financial capital), and physical (variation in technology) and
physical capital resources from one location on the mainland coast. Migrant
selectivity is associated with the type of migration and the age of the
migrant network. During the initial stages of the establishment of the
migrant stream, selectivity is stronger and migration is temporary. The
longer the migration origin-origin destination path is established the less selective
the composition of the stream and the more permanent the migration.

Exploitation of sea cucumbers initially drew particular migrants to the
destinations, however given their limited residence in the destination the
impact of the overall ecosystem well-being may have been relatively
limited. Certainly, their dramatic harvesting of sea cucumbers led to the
closing of the harvest by the government. Unfortunately, it is not clear
whether this diminished migration or whether migrants consequently
settle on the island and brought their families with them. The qualitative
interviews from the case study, suggest this is so. Although the case raises
more questions than its answers, there is strong evidence about how initial
resource exploitation was spurred by a particular type of migrant and
migration. From a migration scholar's more needs to asked about the
selectivity and type of migration in order to more completely understand
the character of migration and the composition of the migrant stream.

In another example from Goa, India, selective out migration and selective
in migration changed social relations concerning ecosystem management
in the coastal tidal plain (Noronha et al, forthcoming). Goa is known to the
world as a place of beautiful beaches and wonderful surricts, but this
characterization is relatively recent. Prior to 1970s (before Goa was
"discovered") the Goa coastal tidal plain was exploited of a relatively
complex set of land use relations making the most of land resources, fresh
water and brackish tidal water to grow rice and coconuts, farm fish, and
palm salt. Goa is also known for its significant historical variability in
migration patterns. In the early 20th century Goa was characterized by out
migration to British India and Portuguese colonies in Africa. After colonial
independence from Portugal in 1961, Goa experienced a surge of return
migration from other Portuguese colonies and British India. Then, in the
1970's Goa experienced selective out migration of young men (both single and
married) to the gulf state nations. As a result, the male labor force was significantly
we show how the migration/environment literature could benefit from a more systematic incorporation of the concepts of social networks and embedded relations, which have become so important to migration scholars’ research agendas. We then describe current evidence and theory in the human ecology literature on immigrant property-resource regimes to show that here, too, important conceptual developments point to the importance of embedded social relations for understanding successful resource management schemes. We conclude this section with a brief discussion of the concept of embedded relations as it is understood by scholars of migrant assimilation processes.

3.1. Current Explanations for Migration

The push-pull paradigm holds considerable sway in the migration-environment literature—however, it begs the question of why and how people move to particular destinations and not others of equally high ecosystem quality, or why and how people move from particular places of origin and not others of equally poor environmental quality. Much of the explanation lies in understanding the intervening set of social relations organizing people’s lives and their relationship to the environment. Some of the most important, new concepts in migration research are social networks and embedded relations. These two concepts have yet to be deployed in analyses of migration and the environment. Lutz and Scherrbov argue that they may be very useful concepts, because where people move depends largely upon social networks (Lutz and Scherrbov 2009) and this factor may be equally as important for explaining migrant impacts upon the environment than sheer numbers of migrants, since social networks imply a degree of integration in both places of origin and destination affecting access to resources and resource valuation in both the short- and long-term.

Migration theory now conceptualizes an individual’s migration decision as conditional upon their social relationships, rather than merely atomistic. These social relationships can be observed within families, households, communities, markets, and nation-states (Stark 1991). It is from this line of research inquiry that social networks emerged as a critical conceptual and measurement tool for understanding the decision to move (Massey 1999).

Social networks in relation to migration are commonly understood as the links between residents in a community of origin and individuals living in another place, or with individuals who have migrated before regardless of their current residence (Massey 1990; Hugo 1990). Social networks increase the propensity of an individual to migrate to a specific destination through three mechanisms: (a) demonstrating feasibility (this includes referring the individual about the possibility of migrating to alternative locations). The contact with former migrants enables individuals realize that they may be
better off in a place other than their current residence (Hugo 1991)); (b) reducing the expected costs and risks. Social networks may reduce "assimilation shock" if immigrants arrive in an environment where others speak their language (Chollín 1970) and where living among other foreigners can easily prevent deportation (Massey 1990)); and, (c) increasing the expected benefits. (This happens when contact with previous migrants helps in the job search process, by both reducing the "opportunity costs" of movement and increasing the long-term benefits (Massey and García-España 1983) (Stark 1991; Taylor 1996). Social networks can also help to save and reduce living expenses and provide financial assistance upon arrival.]

One of the most important insights from this research has been that social networks are cumulatively caused. In other words, as migrant experiences multiply the marginal risks of migration decrease and the marginal benefits of migration increase. Cumulative causation theory predicts, therefore, that moves by individuals who previously would have left home but for their social networks would have left home but for the risks of migration and migrate are more likely to migrate when they know more about migration through multiple experiences of people within their social networks. This means that older migrant streams will be composed of a greater diversity of individuals with much more variable human and financial capital at their disposal. Again, the variability in the history of migrant streams as it relates to the characteristics of migrants has not been systematically evaluated in relationship to environmental impacts. The variable impacts of migrant social networks upon the environment are the least theorized or conceptually explored in the migration-environment literature. The general finding with regard to the relationship between migration and environmental outcomes, especially in developing countries, implicates deteriorating social conditions in both place of origin or destination. In the case of migration impacting deforestation, most findings include important intervening characteristics of poverty, land tenure, export cropping systems and global demand, and agricultural mechanization (Bilsborrow and Carr 2000, Adger 1999). The migration literature would suggest that social networks play an important role in migrant abides to poverty, gain tenure access, participate in export cropping systems, and have financial capital for agricultural mechanization. Further, evidence regarding the impact of return migration suggests the importance of stable social relations diminishing the negative impact of migration upon the environment. By implication return migrants are embedded in a set of social relations which diminishes the impact of migration upon the environment in the destination (Bilsborrow and DeLaggy 1990; Brechin, Suranyy, Heydiz, and Roffler 1993).

3.2.2. Common Property Resource Regimes

The human ecology literature on common property resource regimes, particularly the resilience of such institutions, also points to the importance of understanding social networks and embedded relations. The human relationship to coastal and marine ecosystems has increasingly recognized some form of common property and resource predominate (Ostrom 1998; Ostrom 1987; Ostrom, Burger, Field, Norgard, and Policansky 1999; McCay and Acheson 1987; Pretty and Ward 2001; Begossi 1998; Berkes 1995; Palsson 1998; Hanna 1998). Open access conditions used to be assumed to prevail in marine systems, although there is a growing chorus of dissenters on this point (McCay and Jentoft 1996; McCay and Acheson 1987; Begossi 1998; Berkes 1995; Berkes and Folke 1998; Folke and Berkes 1998). In fact, fishing in many locales is often regulated to more or less success by, at the very least, norms (Palsson 1998; National Research Council 1997). And, Pretty and Ward demonstrate the predominance of common property institutions in a wide variety of ecological or environmentally important contexts, including marine and watershed systems (Pretty and Ward 2001). The growing recognition of the prevalence of common property regimes has generated concern about the institutions’ resilience in the face of social change, their dynamics, and the varying role of local and national governance.

Some have argued that common property regimes are necessarily diminished by population growth (either through natural increase or migration) and thereby population growth contributes to environmental deterioration (Panniyer 2000). Others counter that common property resource institutions respond resiliently to the pressures of population, economy, and politics if the tools of management are in the hands of local communities with the support of national governments for enforcement (McCay and Acheson 1987; Ostrom et al. 1999). However, there has to date been little empirical research or theoretical model to examine the ways in which migration patterns may differently impact common property resource institutions across a wide array of ecosystems, including coastal ecosystems. The human ecology literature finds that there is rarely a condition of open-access and therefore, by implication, Malthusian predictions of population size overwhelming environment resource quality unlikely (Berkes and Folke 1998; Folke and Berkes 1995). The findings in this literature also argue against a solution that involves privatization or socialization (Ostrom 1998; Ostrom 1987; Ostrom, Gardner, and Walker 1994; Ostrom 1990; Ostrom and Walker 1997; Ostrom et al. 1999; Ostrom 1998). More solutions exist than Hardin’s (1968) two extremes (privatization
Migration and Cultural Ecosystems

recognizing the difficulty, policymakers are still faced with the dilemma of accomplishing a balance between individual, community, and national interests of cooperation and conflict (McCay and Jenoto 1998).

Recent research has demonstrated two approaches—one that draws upon the concept of social bonds among people reinforcing normative behavior and expectations (Ostrom et al. 1999), the other focusing upon the "social embeddedness" of human action (Giddens 1984; Granovetter and Swedberg 1992). Using the first approach, Pretty and Ward demonstrate that the social bonds among people enhance collective capacity to manage watershed/ catchment areas, agricultural irrigation, forests, integrated pest populations, and farmers' research. Katz (2000) demonstrates that communities where social bonds have been disrupted through migration into the community by "outsiders" are less likely to have the capacity to take collective action for long-term natural capital enhancement. Implicit in much of this research is that social bonds are diminished through migration because migration disrupts the social bonds of reciprocity and trust which are required for collective action.

The other approach to understanding common property resource regimes, which is not exclusive of the first, is to emphasize how human action is embedded within social relations. In contrast to the preceding approach, however, embeddedness emphasizes location within historically contingent social, cultural, economic, and political relations, as well as environmental conditions. Varying degrees of embeddedness (disequilibrium being the antithesis) can lead to either positive or negative outcomes for individuals, groups, or the environment. The key difference between the two approaches is not the existence of social bonds (which both approaches highlight as important), or that more social bonds are better (as in the first approach), but that each extractive action carried out by an individual or group has variable meaning to the individual or community. This meaning emerges because resource users are embedded in a variety of social institutions, which are themselves embedded, these institutions consisting of family, community, market, or nation-state. McCay and Jenoto (1998) suggest a working hypothesis oriented toward explaining individual behavior, as opposed to group behavior.

Typically, migration into an area is presumed to weaken the social bonds in a place of destination. This appears to be the case in Guatemala (Katz 2000), Ecuador (Bilsborrow 1992), Mexico (Parrado and Homer-Dixon 1996; Lazado, Martinez, and Marquette 1998), the Himalayas (Joffa 1998), and Brazil (Marine 1993, Mcintosh 1993) where movement into a community not only puts added pressure on resource extraction, but diminishes trust, reciprocity, exchange and social bonds (Ostrom et al. 1999). But, this is not always the case. In Indonesia, transmigrants clear half
as much forest as spontaneous migrants because, by implication, they have
greater collective action capacities through greater embeddedness in political
and social institutions at all levels (Bilsborrow 1992). In Ethiopia particular
property systems are deployed to attract migrants to communities (Hogendoorn
1987). Further, migration out of a community may serve to embed an origin
community more effectively, enhancing capacity for long term resource
There is much variability in the success of common property
management regimes (Ostrom et al. 1999). Evaluating success or failure of
marine resource management is hampered by the fact that measurement of
coastal ecosystem viability or sustainability requires intensive longitudinal
observation over wide ranging spatial areas on a scale much larger than that of
terrestrially-based ecosystems (Agardy 1997). Furthermore, there has
been no systematic analysis of how migration affects common property
resource regimes (or vice versa) through embedding processes. To
understand how migration might affect embedding processes we briefly
review the migrant assimilation literature.

3.2.3. Migrant Assimilation and Embedded Relations
The literature on migrate assimilation mirrors that of the human ecology
literature about common property resource relations, insofar as embedded
relations are implicated in the process and are considered critical intervening
conditions for understanding migrant success in places of destination and
migrants' continued ties to places of origin. Accounts of migrant
assimilation describe variability in social networks not only in terms of the
characteristic of the members (as was done in the earlier discussion of
migrant selectivity), but in terms of the character of the relationships
between a migrant and other members of the migrant community and in
relation to external linkages to other social institutions and non-migrants in
the place of destination. The measurement of these phenomena occurs at the
level of the individual, but can be usefully aggregated to characterize groups
or communities.

The literature about migrant assimilation provides greater conceptual
clarity about the embedding processes described in the human ecology
literature. Firstly, it emphasizes understanding the social ties and resources
(social and economic) available to immigrants in places of destination
depending on their relative position within a community - through their
normative obligations and normatively induced behaviors within
communities in places of destination and through the structure of their
instrumental relationships. Secondly, it emphasizes the importance of
understanding the type, flow and distribution of resources (social and
economic) within and between social groups and social institutions. Thirdly,
it emphasizes the importance of the length of temporal vision for affecting
social network formation, growth and its impacts, given the way migration
occurs, who migrates, and the context of reception in the place of
derivation. These three aspects suggest a rationale for understanding the
differential impact of migration upon the environment as mediated by the
migrants' relationship to common property resource relations in places of
derivation.

In the first sense, Portes and Sensenbrenner (1993) identify how
embedding processes can work to create opportunities and constraints for
individual immigrants within immigrant communities. Immigrants who
experience discrimination from the native born community, based on
phenotypic or cultural differences, and/or whose options for exit out of
an immigrant community are blocked (because of limited legal, political, or
economic resources), and whose immigrant community in the place of
derivation has maintained an autonomous cultural repertoire, are likely to
experience bounded solidarity. In this case, the social context of arrival in
the place of destination enhances normative obligations towards the
immigrant community and is expressed in a variety of behaviors (e.g.
voluntarism, charity, and preference for co-ethnics in economic
transactions). Embedded relations of this type are communitarian in nature, i.e.
those making the claims rely on the normatively invoked generosity of
others, whose generosity is unlikely to be repaid directly.

A second way that embedded relations may affect immigrant assimilation
is through enforceable trust, which relies on instrumental motives and the
sanctioning capacity of the community. Limited social and economic
opportunities outside of the immigrant enclave, available in group economic
resources, and sanctioning capacity of communities to enforce reciprocity
arrangements yield flexibility in economic transactions (lower formal
contracts), privileged access to economic resources (like employment or
start-up funds), and reliable expectations that maltreatment will be addressed.
In the short-run this can lead to the emergence of economically important
economic enclaves of entrepreneurial vibrancy (Portes and Sensenbrenner
1993). These types of embedded relations are instrumental in nature, i.e.
those making claims are expected to repay those claims to those who agree
to the demands. The formation of the social bonds among individuals in this
case relies on transfers of assets among group members.

For both expressions of embedded relations, the longer an immigrant
community experiences blockage and discrimination the greater the
likelihood that cultural and linguistic resources are undermined, depriving
the collectivity of the resources necessary to reward or punish members
independently. Instead the collectivity has to rely on externally derived
sanctions, primarily discrimination, which has the effect of downwardly
leveling expectations and aspirations and limiting individual opportunity. Community estrainism by those left behind towards those who leave and abandonment of the community of origin by those who escape is a likely outcome (see examples in Portes and Sensenbrenner 1993). The result is a disengagement of the community from the larger social and economic environment and community and subsequently limited access to opportunities for all members (Stipeck 1992).

How does this discussion contribute towards a more complete understanding of the relationship of migration, social networks, embedded relations and the environment? In the next section we focus on four more case studies as illustration of the importance of social networks and embedded relations for understanding the variable impact of migration upon coastal and marine ecosystems.

3.3 Migrant Networks, Embedded Relations and Coastal Environmental Outcomes

Migrant networks can serve to increase the heterogeneity of migrant stream composition—the provision of information and resources. Migrant networks can also affect social relations in places of destination through their processes. Two examples from Mucurutab Foundation-funded research are used to illustrate these processes. One shows how social relations of communal property management are maintained among migrant fishermen (Ghana) and one shows how variability in embeddedness results in variability in resource exploitation (Guatemala).

Ghanian canoe fishermen are among the most mobile along the West African coast. Documentation shows they leave migrated as far north as Mauritania and as far south as the Congo throughout the 20th century (Overu 2000). Historical accounts point to both push and pull factors contributing to Ghanian fishermen's high degree of mobility. Pull factors include population pressure and land shortages. Pull factors have also been compelling explanations and include relatively better fishing grounds, lower input prices, and lower out prices. But in recent decades political conflict and turmoil have limited Ghanian's access to other nations' fishing grounds. Nevertheless, the striking feature of Ghanian migrant fishermen is the replication of social institutions in places of destination, with recognized local authorities (recognized in places of origin and destination). Migrant fishermen must register with local tribal authorities in places of destination before fishing and conform to the same fishing regulations as those in their place of origin. The social networks linking places of origin and destination ensure strong normative and instrumental embedding relations (Overu 2000). Working through these already-established social networks, some interventions, such as co-

management of fisheries along the West African coast appear to have been successfully established and may for which sustainable fisheries exist in the future. Quite different embedding processes are evident on the Guatemalan coast (Ross and Mendez 2001). A study of the growing commercialization of fishing in Livingston, Guatemala, shows how varying degrees of embeddedness in larger economic and social institutions has marginalized some groups and benefited others, resulting in disparate impacts upon the marine and coastal ecosystem. Q'eqchi, Garífuna, and Ladino migrants moved into the coastal region during the last half of the twentieth century, but their insertion in the local economy is very different with different consequences for resource extraction. Nevertheless they are all involved in fishing activities to greater or lesser extent, an activity that has grown in economic significance for the region in the last five years. Ladino fishers are in a better position in terms of regional and national socio-economic institutions and permissions to access to financial and legal resources for investment in large scale commercial fishing or employment opportunities in such activities as wage laborers. The Garifuna have much lower access to these networks of social support and consequently exploit fisheries resources of lower commercial value, but high nutritional value, supplementing their diets. The Q'eqchi exploit commercial species as well, but in much smaller quantities and only to supplement their income through sales in local markets or to commercial buyers. The impact of these diversified approaches to livelihood strategies is not fully analyzed in the preceding study, but the implication is that diversification results in overexploitation of the fisheries resources to the detriment of the ecosystem (Ross and Mendez 2001).

In both of the preceding case studies social networks and their relationship to embedding processes are implicated in the way migration impacts coastal ecosystems. However, the two case studies differ in the extent to which the embedding processes link origin and destination communities and integrate both normative and instrumental social motives to affect individual behavior. There is some indication that these embedding processes will ensure better management and greater resilience of both the ecosystems in the second, institutional constraints are most at work and to the benefit of some more than others. More importantly, the lack of normative embedding processes results in significant over exploitation of the fisheries resource. Again, neither of these studies offers definitive results, rather they are suggestive of the importance of concepts already well developed in the migration and human ecology literatures, which have not been systematically applied within the field of migration and the environment.

A key element for understanding social networks, embedded relations, and migration is to understand the role of reciprocity in this process. In particular, who does the reciprocating and with whom does reciprocation occur or is
expected to occur? Are there reciprocal exchanges of resources (either natural, financial, or social) among migrants at a place of destination, between migrants and non-migrants in a place of destination, or between migrants and their origin communities? Does the variability in reciprocal systems of exchanges affect the embeddedness of migrants and non-migrants within their social and ecological communities of origin or destination? Asking and answering these questions, which naturally emerge from migration studies, may yield important insights for why migration has both positive and negative outcomes for the communities of origin and destination. The responses to such questions are important to understanding the social and ecological effects of migration and its impacts on destination communities.

The emphasis in the preceding discussion of migration is upon migrant relations in a place of destination. The role of remittances in the migration process mostly addresses migrant relations to places of origin. The literature on the impact of migrant remittances upon development outcomes in places of destination has focused on investment flows. First, remittances are found to increase income and wealth inequality in places of origin (Massey 1985; Massey, Alarcón, Durand, and Góngora 1986; Stark, Taylor, and Yitzhaki 1986; Stark, Taylor, and Yitzhaki 1996). Second, remittances are found to increase consumption, but net greater investments in productivity (Taylor et al. 1996; Taylor 1999). Third, who remits and their relationship to places of origin affects the character of the investment (Lucas and Stark 1985; Portes, Guarnizo, and Landolt 1999; Curran and Sagan 2001). Finally, varying degrees of embeddedness in places of destination and relative to ties to places of origin affects the level and flow of remittances (Curran and Sagan 2001; Ladley and Stark 1998; Lucas 1997; Durand, Portes, and Massey 1996).

All of these aspects can be systematically studied in relation to migration impacts upon the environment. Few studies have systematically considered what is known about migration, remittances, and development in relation to environmental outcomes in places of origin and destination. In the next section, evidence from recent studies in the Asia-Pacific region, suggest the importance of migrant remittances for altering the social relations governing coastal environmental resource use and management in places of origin.

An important, but rarely discussed aspect, is the impact of migration upon the environment in places of origin. One possibility is the alleviation of population pressure upon the environmental resource base through out-migration. To our knowledge there is no empirical research addressing this possibility. Beyond noting the limited theoretical and nonexistent empirical attention to this possibility, this reminder of this section of the essay turns instead to the impact of migrant remittances upon environmental outcomes in the place of origin.

Measuring resource flows within migrant networks is a critical component for an improved understanding of the impacts of migration upon the environment. These are implied within the preceding sections, but not explicit. In the next two examples, these resource flows are important in regard migrant origin communities. Specifically, these two examples highlight the importance of understanding the stock, flow, and meaning of remittances exchanged between migrants and their origin communities. Asking questions about the level and frequency of remittances, as well as who remits and who receives the remittances, adds a layer of complexity to the previous discussions about migrant selectivity and social networks. An example from Vietnam illustrates how communication of both selectivity and remittances has an important impact upon ecosystem management. An example from Micronesia illustrates how both selectivity and social networks combined with remittance patterns have a detrimental effect upon crab populations and mangrove forest stands.

In a small-scale, longitudinal study of Vietnamese households located in the Red River Delta on the northern coast, Adger et al. (2001) analyze the role of migration and remittance income for affecting livelihood outcomes between 1995 and 2000. With regard to remittance income and household investments in aquaculture, the research was shown to have significant negative impacts upon mangrove forests and other fisheries (Naylor et al. 2000; Goldburg and Triglum 1997). Deforestation of mangroves also increases risks of floods and undermines the availability of marine and fish resources for the entire community. They find that over the five-year period of study the households in the study site have significantly increased their reliance on remittance income, expanded aquaculture production, and reduced agricultural production. They conclude it is the combination of the loss of labor through migration and the remittance income which has shifted local production activities away from labor intensive paddy cultivation to less labor intensive aquaculture investment, especially for wealthier households (Adger, Kelly, and Locke 2001). They note that in the combination of the loss of labor through migration and the remittance income which has shifted local production activities away from labor intensive paddy cultivation to less labor intensive aquaculture investment, especially for wealthier households (Adger, Kelly, and Locke 2001). They note that in the combination of the loss of labor through migration and the remittance income which has shifted local production activities away from labor intensive paddy cultivation to less labor intensive aquaculture investment, especially for wealthier households (Adger, Kelly, and Locke 2001). They note that in the combination of the loss of labor through migration and the remittance income which has shifted local production activities away from labor intensive paddy cultivation to less labor intensive aquaculture investment, especially for wealthier households (Adger, Kelly, and Locke 2001). They note that in the combination of the loss of labor through migration and the remittance income which has shifted local production activities away from labor intensive paddy cultivation to less labor intensive aquaculture investment, especially for wealthier households (Adger, Kelly, and Locke 2001). They note that in the combination of the loss of labor through migration and the remittance income which has shifted local production activities away from labor intensive paddy cultivation to less labor intensive aquaculture investment, especially for wealthier households (Adger, Kelly, and Locke 2001).
These households, in turn, were more likely to use mangrove wood for fuel (twice as much fuel as households linked to the formal economy).

Besides mangrove fuelwood extraction, crab harvesting also takes place. Crabs occupy an important ecological niche within mangrove forest systems as well as an important economic niche for Micronesians. Crab consumption also appears linked to migration in two ways, yet to be completely explored by Naylor et al. First, until recently the most important reason for crab harvesting was gift export: the household manages礼品出口 households with greater levels of migration and remittance income are more likely engaged in crab harvesting. One way to consider the gift exports is to see them as a way of increasing ties to migrants in order to ensure steady, remittance flows. Secondly, crab consumption has increased significantly since 1996 and 2000, matching gift exports. Crabs are being sent to seafood restaurants in Guam, presumably because of prior migration networks. Despite the increases in crab harvest, Naylor et al. also show that crab abundance is declining as the per unit effort has dramatically increased with time. Thus, in two ways migration and remittances may be driving particular types of resource exploitation behaviors on the part of Micronesians. First social networks have increased origin village contacts and opportunities to trade and market ecological resources of concern. Second, remittance income is so important to the maintenance of Micronesian households that crab gift exports are used to ensure a steady resource flow. These last statements are conjectures and not tested directly by Naylor et al. However, given the literature on migration, social networks and remittances there are likely similar patterns.

The preceding example demonstrates the importance of considering the role of migrant remittances in relation to ecological outcomes in places of origin. Admittedly, the two examples are relatively sketchy in their detail, but from a migration scholar’s perspective they point to further, more systematic inquiries. In the first example the combination of migrant selectivity and the flow of remittances back to a place of origin suggest there has been a significant impact on reorganizing agricultural production or resource exploitation from paddy rice farming to aquaculture. In the second example, migration, social networks and remittances appear to have increased mangrove deforestation and crab harvests, significantly affecting the abundance of crabs.

4. CONCLUSIONS

This paper shows that there is a timely convergence of ideas and demand for empirical evidence for understanding the relationship between population and coastal ecosystems. Coastal ecosystems are under increasing pressure from population growth as a result of migration, industrial development and ecological resource exploitation. Through a review of the migration and environment literature, several themes are identified as being of particular importance for explaining particular environmental outcomes. These themes include migrant selectivity, social networks, and remittances. However, the review highlights how these themes have not been systematically studied as one might expect from a migration scholar’s perspective. Migrant selectivity has not been systematically explored (especially regarding sex, age, and human and financial capital). Neither have migrant social networks been systematically linked to resource use or property relations in either place of origin or destination. Further, very little research has focused upon the relationship between migration and coastal ecosystems.

We are continually a long way from fully understanding the connections between human population growth and aspects of consumption such as subsistence demand, commercial production, and international markets. We are even further from a clear understanding of how the resource use and the indirect impacts on the environment related to these changes in population and consumption affect environmental health and the ability of ecosystems to provide goods and services. On the one hand, we have only just begun to comprehend how to bridge differences in scale from the household to the national level, and remain constrained in understanding the drivers behind demographic growth, migration, consumer behavior, and other dynamics of human populations. On the environment side, we have yet to understand which measures or environmental parameters serve as the best indicators of environmental health and production potential. And determining causal links between population change and environmental change has been notoriously difficult, requiring decades of ecological study.

Interdisciplinary studies on the relationship between population change, consumption, and environment constitute an important new specialized field. The growth of this research has been driven by the need for social scientists and policy analysts, working together to understand how population growth and resource use affect environmental quality and corresponding delivery of goods and services. Though this paper draws evidence from cases in less developed nations, the generalizations may not be limited to such contexts. Demands for better understanding of the population/environment relationship are rising in developed and developing countries simultaneously.

A review of the human ecology literature with regard to coastal and marine ecosystems reveals the prevailing attention to common property
Migration and Coastal Ecosystems

In conclusion, tantalizing insights can be drawn from numerous studies around the world that point to the need for a reformulation and repackaging of effort in collecting data and conducting research on the relationship between migration and the environment. Based on the evidence from the literature we suggest that there is a convergence around particularly important concepts, especially embedded relations (as a combination of both migrant selectivity and social networks), to explain the relationship between migration and the environment. The limited scientific attention among migration and environment scholars towards coastal ecosystems, the significant role of coastal ecosystems to human livelihoods of all forms, and the growing population along the world’s coasts, all necessitate an approach that incorporates the most recent conceptual and methodological approaches in the fields of migration, common property resource management, and coastal ecology.

REFERENCES


Migration and Coastal Ecosystems


Migration and Coastal Ecosystems


