

Too Big To Ignore Research Report

Number R-04/2017

Too Big To Ignore

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Global Partnership for Small-Scale Fisheries Research

Towards Sustainable Small-Scale Fisheries: Key Considerations for Transdisciplinary Teaching and Training

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Global Partnership for Small-Scale Fisheries Research

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Preface

Small-scale fisheries are vast in number and both diverse and complex in nature. These fisheries can be found around the world in all types of aquatic environments, in urban and remote areas, using a range of gears, targeting numerous species, and engaging a diversity of individuals, groups and communities. Post-harvest activities also vary greatly, often involving family members participating in processing and marketing. The value and importance of small-scale fisheries go beyond livelihoods, food security and income, to include community cohesion and social safety nets. In many instances, small-scale fishing communities illustrate strong stewardship ethics, making an important contribution to the protection of species and habitats in their region and beyond. These characteristics call for careful consideration in policies and governance that promote viability and sustainability of small-scale fisheries. Likewise, alternative approaches are required to understand the intricacies of the fisheries systems as well as to address problems and challenges facing them. Such approaches are also needed to support the implementation of the Voluntary Guidelines¹ for Securing Sustainable Small-Scale Fisheries (SSF Guidelines; FAO, 2015).

Under this premise, Too Big To Ignore (TBTI) promotes a ‘transdisciplinary approach’ to teaching, training and learning about small-scale fisheries worldwide, as well as capacity building to respond to many challenges facing small-scale fisheries. Here, we define, a transdisciplinary approach as one which goes *‘between, across and beyond’* disciplines and ways of knowing and doing, in an attempt to address real-world problems and moving towards pragmatic solutions. This ‘open’ transdisciplinary approach also implies a bottom-up process involving various stakeholders in knowledge production and collaborative problem solving. Therefore, it includes local and traditional ecological knowledge, and knowledge about society, communities and livelihoods.

While the transdisciplinary approach and perspective are commonly encountered (e.g., in sustainability science, medicine, etc.), applications in fisheries are still

¹ Voluntary Guidelines for Securing Sustainable Small-scale Fisheries in the Context of Food Security and Poverty Eradication (FAO, 2015), the SSF Guidelines, have been developed as a complement to the FAO Code of Conduct for Responsible Fisheries, to support the visibility, recognition and enhancement of the already important role of small-scale fisheries, fishers, fishworkers and related activities, promoting a human rights-based approach.

limited. This report aims to stimulate interest in transdisciplinary research, teaching and training, particularly where sustainability of small-scale fisheries is concerned. Many international researchers and practitioners have contributed to the development of this document, which began in 2015 (see the Acknowledgment for details). The development process involved online collaboration, workshops and field visits, all done as part of the TBTI 'Transdisciplinary Fisheries' research cluster during the period between September 2014 to March 2016. The initial outcomes of this work have been described in the 2015 'Transdisciplinary Fisheries Course Development' and 2016 'Developing a Transdisciplinary Fisheries Course' TBTI research reports.

Visits to Rio Lagartos, Yucatán, Mexico, in March 2016 enabled us to interact with local stakeholders and learn more about the case study. These lessons and the feedback from the community were also useful in fine-tuning some concepts and in further development of the training materials.

The report outlines the philosophy and principles of this transdisciplinary approach and provides a possible course structure, with some materials, including a case study. The document follows an upper-level or graduate level university course structure. Nevertheless it can be easily adapted and modified to suit a range of target groups and delivery methods, such as community workshops, or training sessions for government officials, practitioners and non-governmental organizations. Our goal in the near future is to produce additional training materials, including a textbook on 'Transdisciplinarity' in Fisheries, and make them available on an online, open education and learning platform.

What is transdisciplinarity, why and for whom?

Many definitions of transdisciplinary approach are offered in papers and reports. Generally, a transdisciplinary approach to teaching and learning refers to problem-based and context-specific methodologies, which integrate multidisciplinary perspectives, practices, and tools to address the complex reality of the world and to generate new insights and discoveries. While not bounded by methods from any specific discipline or sector, a transdisciplinary approach aims at creating new perspectives that allow for a deeper understanding of a topic or issue, through a collaborative process with a range of stakeholders, including fishers and community members, who participate in co-identifying the problems, co-producing the knowledge, co-designing the approach to address the problems, and becoming co-owners of resulting actions. This 'open' transdisciplinary approach implies that academic and non-academic actors are encouraged to interactively engage with each other throughout the entire process.

The holistic nature of the transdisciplinary approach aligns well with 'interactive governance' (Kooiman et al. 2005), which aims at understanding the characteristics of the natural and social systems associated with fisheries, and of the governing systems, as well as their interaction. Because the problems facing fisheries governance are often "wicked" in nature, there is no simple formula available to address them (Jentoft and Chuenpagdee 2007). A "wicked" problem generally refers to a complex problem for which there is no simple method of solution and for which there is no clear stopping rule (Rittel and Webber 1973). Applying the transdisciplinary approach to address fisheries problems thus begins with recognizing that not all fisheries are equally governable and that the challenges in governance may come from multiple sources. A systematic assessment of governability of the fisheries system is therefore an important first step (Chuenpagdee and Jentoft 2013).

The transdisciplinary approach is applicable to small-scale fisheries contexts for many reasons. First, the wellbeing of small-scale fishing people and the contribution of small-scale fisheries to society in alleviating poverty and sustaining food security cannot be explained by reference to a single factor, such as a good income or material wealth, neither is it only related to a good ecosystem health. Although these are important conditions for human well-being, the perspective must be broader: a good and meaningful future for participants in small-scale fishing must provide opportunities along a range of dimensions, which include family and community, and all of the freedoms that are associated with a good life. Included here are the prospects of pursuing sustainable income generation, healthy lifestyles and education, facilitating empowerment, individual and collective self-realisation, cultural and spiritual integrity, and cultural/spiritual

health. Thus, as can be seen from the SSF Guidelines, policies targeting small-scale fisheries should be holistic and systemic, i.e. beyond fisheries and fisheries departments, with coordination and integration across sectors, institutions and disciplines. This must also be reflected in programs aimed at capacity and knowledge building, which must also be problem-oriented and reflect the local social and ecological experiences and knowledges of small-scale fisheries practitioners along the entire value chain.

While it is fair to say that everyone involved in any aspect of small-scale fisheries would benefit from receiving a transdisciplinary training, such training can be customized to suit three main settings, albeit with some overlap between all three. In fact, more often than not, the audiences are mixed, and thus a mixture of approaches and delivery techniques will be required.

Audience types

1) Local community-level training: Target groups are at the local community level, starting from fishers themselves, fish processors and also including other community members, government officials, environmental organizations, business, etc.

As a first step, a transdisciplinary approach for sustainable small-scale fisheries inherently requires the participation of the fishers themselves. The multi-specific nature of most small-scale fisheries, the high percentage of the catch that is destined for local and subsistence consumption and the large impacts that broad national policy measures can have at the local level, create the need for the fishers themselves to actively participate in transdisciplinary approach. This helps to improve social, natural and governance conditions in small-scale fisheries. Fishers understand the interconnectivity of the different factors that may affect their fishery; however, in many cases their lack of formal education can prevent them from effective planning and putting appropriate measures into practice.

Through transdisciplinary training, we aim to help fishers, local managers and other stakeholders to better understand the interconnectivity of the multi-specific fisheries on which they rely, and how small factors or changes can reverberate through the natural, social or governance systems at local, regional, or national levels. The use of local case studies will provide examples with which participants can relate, develop critical thinking skills, and explore the most effective and socially, culturally, economically, environmentally acceptable ways to achieve sustainability in the exemplified small-scale fisheries.

2) Practitioner training and ‘training-of-the-trainers’ (ToT): Target groups are practitioners, typically working with different government agencies, but it can also be fishers and community representatives, environmental groups and NGOs working closely with the communities in capacity development initiatives, research and vocational institutions, particularly those with extension services mandate, and funding and donor organizations interested in promoting sustainability of fisheries.

The implementation of public policies aimed at small-scale fisheries management and development still faces challenges. These challenges are directly related to the social and economic characteristics of these fishing communities, and to the existing legal and institutional instruments, as well as the intrinsic and complex relationships of small-scale fisheries with natural resources. This makes it necessary to generate new insights and discoveries through a problem-based and context-specific approach to recognize the outlook, principles, tools, methods and qualities of the results that distinguish transdisciplinary from (single) disciplinary approaches.

Actions to integrate a transdisciplinary approach in a public management context should prioritize looking at issues in a wholesome manner in order to understand and track their progress. In addition, the integration of a transdisciplinary approach in a public management allows us to discuss the results of observation and to propose when intervention is necessary and how a given issue or situation should be managed. Practitioners can also understand differences in the level of intensity of issues and how solutions demand changes depending on the context within which issues exist, allowing them to foresee solutions in the future. Through ToT programs, new capacity will be developed to enable early recognition of economic, social, political-institutional, and environmental situations that demand immediate attention, and thus can lead to timely and concerted actions in anticipation of environmental changes and the related potential threats.

3) Formal training and ‘online learning’ platform: Learners are in an academic-type setting, typically at the post-secondary/university level as part of a formal course. University professors and other teaching professionals seeking an alternative approach to teaching fisheries are encouraged to use the course materials. Civil society organizations, environmental organizations and members of the general public with an interest in fisheries will also find the materials relevant.

The course is also intended for early career researchers, graduate and post-graduate students, who may have ventured into ‘interdisciplinary’ programs and yearning for something that may help propel their interests further. Formal and online transdisciplinary training offers an opportunity to tap into existing or potential synergies that may help elevate the discourse, as well as addressing real

world problems. The practicality of such training is likely not going to be known to the participants until many years afterwards. However, while it is not likely that transdisciplinary will become part of an academic program in the near future, having the transdisciplinary training as part of a portfolio would add to the students' preparedness and expertise as resource persons equipped to comprehend and respond to future challenges.

Philosophy, principles and goals

The transdisciplinary approach for sustainable small-scale fisheries emphasizes the need to broaden perspectives as well as the knowledge and skills required to understand and appreciate the complexity of small-scale fisheries and the associated governability challenges. The challenge is also inherent in the difficulty to balance between sustainability and maximizing production and revenues. It is a holistic problem-solving approach, which encourages participants to transcend their previously acquired knowledge. A starting point will be to learn to work with people from across disciplines and then eventually go beyond academic disciplines, incorporating for instance different types and sources of knowledge into the process of problem solving. Transdisciplinary work is viewed as a process, emphasizing inclusiveness and values of diverse viewpoints, and knowledge of different stakeholders involved in the use of natural resources. It emphasizes the need to be adaptive, collaborative and interactive, among other things.

The transdisciplinary training is based on the premise that it is possible to improve fishing practices and add value to the artisanal fisheries production by building adequate and competent leadership to address complex problems. The transdisciplinary process will improve capacity and increase the learning and sharing of best practices among communities, conservationists, government and the private sector. It will only lead to sustained behavior change if it is nested within broader initiatives to improve livelihoods while maintaining sustainable fisheries.

Principles

Four categories of principles underlie the transdisciplinary perspective.

1) Approach principles

Transdisciplinarity is considered an 'approach,' both in the framing of the problems facing small-scale fisheries and in the process and tools required to address them. As part of problem framing, key principles include, but are not limited to, holistic, multi-scale, and systemic perspectives. In problem solving, some principles are questioning the status quo, thinking outside-of-the box, and challenging the stereotype. Both the framing and process approaches are supported by working through and across disciplines and knowledge systems.

2) Personal trait principles

Several personality traits are important for transdisciplinary work, including empathy, which allows participants to see problems from multiple perspectives and value different opinions. This principle makes it possible for participants to convey strong human dimensions, in addition to scientific techniques and knowledge, to help them apply a combination of both in solving real world problems in the context of small-scale fisheries. There is also a need for innovation and willingness to engage with dynamic and complex contexts, together with the commitment to apply a transdisciplinary approach to achieving sustainability. The development of flexible learning agenda that fits into special and unique conditions while taking into account the cultural dimensions of the communities in interacting with the natural environment is also important.

3) Process principles

Transdisciplinary training is based on the premise that fisheries management is an iterative and adaptive process.

The process principles describe the specific steps to be taken during the transdisciplinary process. Many of these process principles focus on inclusion of diverse viewpoints and knowledge and the need to recognize power relations in all steps of the process (e.g. stakeholder identification, and knowledge access, production, and sharing) to ensure that potentially marginalized groups are meaningfully included in the transdisciplinary process.

To facilitate interactions, there is also a focus on the promotion of common language, and idea and information exchange. Overall, this principle aims to ensure that solutions to small-scale fishery related problems are not one-size-fits-all or quick-fix in nature. It highlights the need for moving away from the trap of considering approaches as panaceas. Transdisciplinary process includes a networking aspect to maintain an open forum for addressing continuous problems and issues facing artisanal fisheries.

4) Outcome principles

The outcome principles outline the expected results of a transdisciplinary approach. By integrating theory and practice, a transdisciplinary approach would: 1) produce and communicate a new and holistic perspective and understanding of the problem; 2) open pathways for ongoing problem solving; and 3) facilitate change, with the ultimate goal of supporting the sustainability of small-scale fisheries and fishing communities; 4) provide an avenue to re-engage in the problem-solving loop based on lessons learned, and 5) affect contextually relevant

policies and management. The outcome principles will ensure that any outcome or results are coherent with other transdisciplinary principles such as approach, personal traits, and process.

Vision and goals

The overarching vision of the course is to teach and learn transdisciplinary approach that will improve and increase understanding, value and successful management and governance of small-scale fisheries. A transdisciplinary approach embraces complexity of small-scale fisheries and governability challenges in achieving sustainability, including the diverse viewpoints and priorities of different stakeholders. This course aims to examine and integrate different theoretic perspectives often used to approach issues within small-scale fisheries: 1) natural science, 2) social science, and 3) governance.

The framing of small-scale fisheries complexity will include integrated, multi-scale systems, and multi-stakeholder approaches. Figure 1 captures the essence of the transdisciplinary model, with the interconnectivity of the natural, social and governance systems at the core. The figure suggests that certain characteristics of the fisheries and related issues belong to certain systems, while some are cross-systems. All issues listed in Figure 1 have inherent cross-system dimensions and can benefit from the application of transdisciplinary approach to problem solving in those seemingly system-specific issues.

One exercise in transdisciplinary approach is understanding the nature of the fisheries problems and recognizing that they may shift and change depending on what domain(s) they belong to. Transdisciplinary training encourages a broadening of the perspective and the recognition that a large body of knowledge may be required and that addressing fisheries problems is not a task of a single person or any one discipline. Various skill sets need to be developed for ongoing problem solving through collaborative, adaptive, interactive and context-dependent processes. This may include examining and assessing methods for knowledge production, integration, communication (both among and beyond disciplines/academics), and methods of stakeholder identification and involvement in all stages of the transdisciplinary process.

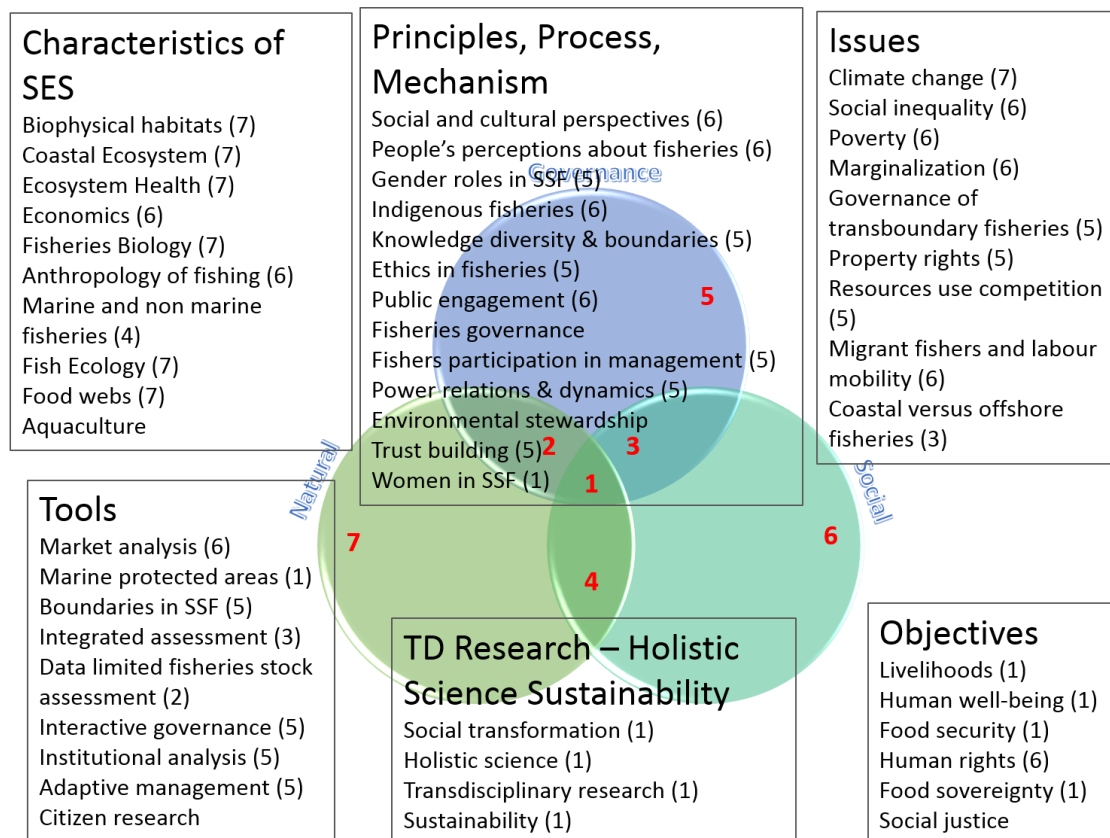


Figure 1. Transdisciplinary model and components

Course structure and contents

There are numerous ways to organize the course, depending largely on the audiences and the purposes. Table 1 shows a possible list of objectives, both the ‘must-know’ and the ‘good-to-know.’ The list was populated as part of the exercise during the transdisciplinary workshop in Merida. It is presented to show the spectrum of possible objectives, and it is not meant to be a guide for an actual course.

Table 1. A list of possible objectives for a transdisciplinary course

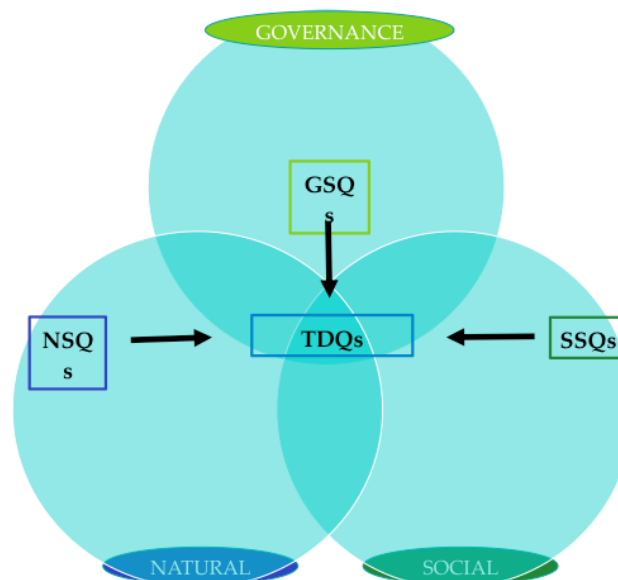
Objectives	MUST BE MET	GOOD IF WE COULD
Use basic GIS		
Identify and use social science research methods		
Identify values of SSF		
Identify community leaders / fisheries management champions		
Be adaptive and flexible		
Describe the governability system		
Conduct and / or include participatory approaches		
Engage stakeholders in social justice issues		
Describe the value chain		
Generate, handle and store data		
Involve different stakeholders in planning		
Develop and use common language		
Develop culturally relevant communication and presentation processes		
Facilitate interactions amongst diverse stakeholders		
Incorporate contextually relevant policy, communication and information structure that fits policy ‘mental model’.		
Develop methods to monitor SSF public policies implementation		
Use rapid appraisal approaches		
Identify/assess community vulnerability and adaptive capacity		
Develop capacity-building based on trust (ethics and moral)		
Others [add as appropriate]		

An exercise in thinking like a transdisciplinary researcher may also be useful. Box 1 suggests what can be done to encourage this.

Box 1: Approaching a problem through a transdisciplinary lens

A key question in transdisciplinary research is when and how a research question becomes a transdisciplinary question. In other words, how disciplinary domain-specific questions move towards the transdisciplinary domain and acquire the characteristics of being a transdisciplinary question. This can be a crucial first step because only a properly defined transdisciplinary question can lead to a transdisciplinary problem analysis and its eventual solution.

The diagram below represents processes through which transdisciplinary questions can be framed. As depicted in the diagram, there are three important knowledge domains or systems within which the primary research questions arise, i.e., questions within natural science or system (NSQ), questions within social science or system (SSQ), and questions within the governance system (GSQ). A transdisciplinary team engages with these questions to find out connections and overlaps between them (i.e., how a natural science question may have resulted from and/or contributes to a social science or governance system question and vice versa), and turn these domain specific questions into complex, but solvable transdisciplinary questions (TDQ).



As the diagram indicates, the transdisciplinary questions domain (TDQ) is the overlapping area in the middle of the three disciplinary domains. There are different ways in which a disciplinary question may become a transdisciplinary question; here we introduce two of them. One, a disciplinary question in any given domain or system can move towards the transdisciplinary domain (e.g., a single arrow from one domain to the middle overlapping transdisciplinary area) and turn into a transdisciplinary question. Two, similar or identical questions from more than one disciplinary domains can move to the transdisciplinary domain and synergistically form one transdisciplinary question (e.g., meeting of multiple arrows from different disciplinary domains in the transdisciplinary domain). Once the transdisciplinary question is arrived at, the transdisciplinary team is in a better position to deliberate on possible methods, strategies and processes to move towards a transdisciplinary solution.

Course activities

Regardless of the purposes and the actual content of the course, there are several activities that can be integrated to encourage learning about different elements of transdisciplinary approach. Below are different ways to integrate principles, processes, and methods into course activities, either as part of the lectures, exercises or other teaching formats.

Principles [*Key principles to reiterate and practice throughout transdisciplinary training*]

- Action-engaged participatory research with impactful results
- Working across all scales/levels and being flexible in their use
- Clarify linkages being made in transdisciplinary research
- Team approach - recognizing the need for multiple people (i.e. complementary knowledge and expertise)
- Understanding that fishers already have capacity, but can be assisted by academics in crossing the bridge between science and policy
- Revisiting the big question often and reframing as needed
- Transdisciplinary work can transform SSF, but we must first transform ourselves
- Communication and networking

Methods [*Things that participants should be able to do, as part of the learning objectives*]

- Draw from good practice in collaborative/engagement/participatory approaches
- Be good listeners, remove judgement, and recognize own bias
- Identify and include stakeholders
- Understand where we are lacking (tools, abilities, etc.) to get to the solution
- Learning how to properly phrase questions in a “universal” way
- Using universal language in course building
- Learning the languages of other disciplines and their standards of good practice
- Creating and connecting the dots between attributes of disciplines
- Build bridges between community-policy-research
- Learn how to be a leader
- Learn how to be goal-oriented and a team player
- Conflict management, including local concepts/traditional conflict management

Process *[Some guiding questions and exercises that can be integrated into the training]*

- Do people always see the issues and do they think anyone is doing anything about these issues?
- We need to discover the smaller processes to see the larger trends/processes
- Gaining trust by having contacts and support in the community of research as well as within the transdisciplinary team
- Listing the core values and principles that create cohesiveness in a community and help them respond to problems/crisis
- Mapping the context of an issue or area
- Discovering the areas of inquiry where research is necessary
- How do fishers want their story to be told? Storytelling and deriving its components using this question as a structure
- Recognizing visible groups of academics, government, locals, etc. as a team and finding out if there can be a community-level transdisciplinary team at a micro-scale

Indicators *[Some measures to use to evaluate whether transdisciplinary approach takes place; can be part of the Evaluation]*

- Diverse membership in the transdisciplinary group
- Being active in research
- Dissemination of results
- Willingness of fishers to participate in research
- Robustness – linking to principles
- Knowledge integration at every step of the process
- Monitoring graduates of the transdisciplinary experience in the future
- Reflection and improved self-awareness
- A new case study as an outcome of the transdisciplinary training
- Post- transdisciplinary training communication

Terminologies *[Terms to be covered, explain, discuss]*

- Transdisciplinary
- Small-scale fishery
- Governability
- Governance
- Sustainability

- Dynamic (natural system & social system)
- Cohesiveness
- Emotional challenges
- Self-awareness
- Scale/ level and the concept of scale mismatch
- Capacity
- Intervention
- Cultural interaction with nature
- Best fishing practices
- Value chain
- Public-Private-Partnership (PPP)
- Ecosystem
- Complexity (linear thinking, problem solving and policy-management vs. circular thinking, complexity and systems approach)

Learning transdisciplinary approach through case studies

Why Case Studies?

"A case study approach brings you closer to reality. We need to understand that context is always something unique for every situation and how you deal with each case is unique. Going through this course and knowing the particularities of a situation or an area will allow [learners] to take knowledge and apply it elsewhere." – Svein Jentoft, Merida 2016

A case study offers one of the most practical ways in which the diversity of knowledge and expertise within the transdisciplinary group could be meaningfully used because each member of the team approaches the problems offered by the case using their core expertise. The case study becomes a common platform for them to develop transdisciplinary perspectives and collaborate with each other in moving towards solutions. Sometimes members of the transdisciplinary group may not immediately learn from each other due to inherent biases they bring with them from their own disciplinary perspectives (and find it hard to accept and recognise what other disciplines have to offer). In such situations, the case study becomes a neutral object from which the group members learn about each other's perspectives and move towards creating a transdisciplinary environment.

It should be noted that approaches other than case study should also be considered, depending on the context. For instance, a project-based learning, which is "a dynamic classroom approach in which students actively explore real-world problems and challenges and acquire a deeper knowledge," might be more suitable in some settings.

The case study approach was implemented in the test-run of the transdisciplinary model (see below).

Transdisciplinary model testing

The following is based on a test-run of the transdisciplinary model conducted by Ratana Chuenpagdee as part of the online course titled “Social and Philosophical Issues of Fisheries Management”, a graduate level course offered at Marine Institute, Memorial University of Newfoundland in May 2016.

The course was organized into four 4-weeks units, as shown below. The transdisciplinary module was Unit 3 of the course.

Unit I: Crises in fisheries and the need for management and governance

- History of fisheries development, Newfoundland and world
- Diversity, complexity, dynamics and scale in fisheries
- Concerns and issues in global fisheries
- Challenges in fisheries management

Unit II: Current and alternative approaches to fisheries management

- Fisheries as a linked social-ecological system
- Technical fixes in fisheries management
- Challenges and issues in current approaches
- Alternative approaches to fisheries management (universalism (vs contextualism))

Unit III: Case study analysis

- Big questions affecting fisheries sustainability
- Case study approach
- Transdisciplinary perspective and principles
- Transdisciplinary methods and skills

Unit IV: From management to governance

- Fisheries governance and wicked problems
- Meta concerns: rights, justice and power
- Who and what counts?
- Interactive learning (multi-scalar).
- Policy relevant to different scales and policy coherence across scales and values

Ten students took the course. Each unit began with a video introduction, summary of course contents, expectations, exercises and readings. Below are the scripts of the video introduction of Unit 3, followed by the instruction for the group exercise about the Rio Lagartos case study, based largely from the discussion at the Merida workshop.

The reflections from the students, both as a group and individuals, about this particularly unit were very encouraging. Below are excerpts from these reflections.

“The group gained significantly from this experience; however, the most important lesson was that a variety of backgrounds and opinions are integral when addressing complex issues. Building on the analyses of each group member created a more robust group perspective. In this way, the group was able to thoroughly analyze the issues at hand, and incorporate the ideas of multiple disciplines to create a refined suite of transdisciplinary recommendations”.

“Trans-disciplinary issues are complex and are not easily solved as indicated by Lang et al. (2012). As we have learned throughout the course, there is not one “right” formula to use to solve all the problems that intertwine within this ‘wicked problem.’ Governance can come at the problem at many angles. Having actors from many different backgrounds and perspectives can assist in untangling issues where many actors are involved. As in the case study, backgrounds of various group members can help to see issues in a different light and bring out new perspectives”.

“Concerning the content itself, the issue identification process was one I found to be effectively carried out together. The diversity of perspectives on what the true issues are made compiling the case study exciting and illuminating. And beyond that, I would not have expected to identify the problems in the way that we collectively did. So, I was surprised to see both agreements on how some problems are framed and productive disagreement when they did were understood differently”.

“The most difficult task for me was segregating issues into distinct categories as arguments can be made for most, if not all, of the issues to be applicable to the natural environment, social structure and governance system. The most frustrating moment was feeling like group members were not going through the exercises as a cohesive unit. As a result, I believe that the most important ingredient in group work is good communication and ensuring at the beginning of the work that everyone is on the same page with a clear plan for coordinated completion of the exercises”.

“The most difficult task was assigning who should have the most say and why. It’s easy to say that the fishers should have more of a voice and role in decision making as this develops ownership of resource in question. It’s more difficult to assign how or why different groups should be prioritized in the hierarchy of decision making. There are no easy solutions, especially with a local government that has little resources or interest in managing small-scale fisheries”.

Unit 3: Video introduction texts

The global concerns in ecosystem health, food security, livelihood sustainability and social justice, also in the face of climate change, put pressure on fisheries management and governance, to deliver timely and effective solutions. But as previously discussed, fisheries governance is a wicked problem, thus we have to be innovative in how we approach fisheries problems.

One way to do that is to approach it from a 'transdisciplinary' perspective. There are many ways to talk about transdisciplinarity and what it means. Generally, it speaks to teaching and learning approach that aims to integrate disciplinary perspectives, practices, and tools to address the complex reality in the world, as well as to generate new insights and discoveries. It is a field of study that is not bounded with methods from specific disciplines. Instead, it attempts to integrate different philosophies, theories and methods, creating new perspectives that allow for a deeper understanding of a topic or an issue. As such, a transdisciplinary perspective can be useful to explore, in addressing wicked problems in fisheries.

Transdisciplinary perspective is particularly relevant in small-scale fisheries. This is because the wellbeing of small-scale fisheries people and their contribution to society in alleviating poverty and food security is not confined to a single issue, such as income and material wealth. Neither is it only related to ecosystem health. Although these are important conditions for wellbeing, the perspective must be broader: A good and meaningful future in small-scale fisheries must provide a wide range of opportunities, including to fishing families and communities, and all the freedoms that are associated with a good life. Included here are the prospects of pursuing good health and education, facilitating empowerment and individual and collective self-realization. Thus, policies targeting small-scale fisheries should be holistic and systemic, i.e. be beyond fisheries and fisheries departments, with coordination and integration across sectors, institutions and disciplines. This must also be reflected in programs aimed at capacity and knowledge building, which must also be problem-oriented and reflecting the local social and ecological experience, diverse values and expectations, and knowledge of small-scale fisheries practitioners along the entire value chain.

One approach to transdisciplinary teaching and learning is through case study. A case study approach brings you closer to reality. We need to recognize the importance of context, that there is always something unique for every situation and how we deal with each case is therefore unique. A case study approach offers practical ways in which a group of people could work collaboratively to address a single problem, each bringing to the fore diverse knowledge and core expertise. The case study becomes a common platform for researchers to recognize personal bias and to develop transdisciplinary skills. Importantly, the case study becomes a

neutral platform from which the group members learn about each other's perspectives and move towards creating a transdisciplinary environment.

It should be noted that approaches other than case study could also be considered, depending on the context. For instance, a project-based learning, which is a dynamic classroom approach in which students actively explore real-world problems and challenges and acquire a deeper knowledge, might be more suitable in some settings. The important point is to recognize that on our own, we may not be able to address the problem, but by working together, following transdisciplinary process and principles, we may be in a better position to address it. Finally, we should all learn that it is okay not to know everything, and the anxiety about 'not knowing' is something that we need to learn to live with. In many ways, being transdisciplinary in our practice is about being a bit uncomfortable about what we think we know, as what we know might not be what it takes to address the problem, as well as being humble about what we don't know, as opposed to be very anxious about it.

Group exercise: Case Study of Rio Lagartos

Introduction and objective

The main objective of this unit is to introduce the participants to a 'transdisciplinary' concept using a case study approach in addressing small-scale fisheries problem. Participants will work in groups throughout the unit.

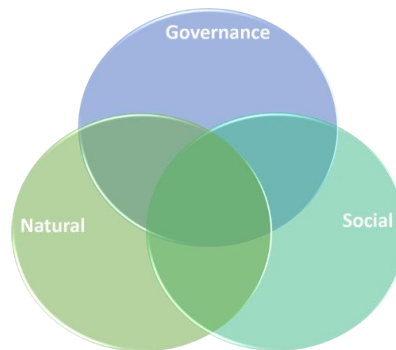
First, participants should view the introductory video, read the assigned readings and look at the PowerPoint presentation. Make sure to read the 'note' associated with each slide. Then you should read the 'case study background', along with viewing the video presentation by Professor Silvia Salas, from CINVESTAV *[not included here]*, who has been working in the area for at least 15 years.

Once you have done that, work in your group on each exercise. Each exercise forms a section in your group-written assignment. There is no page limit to the write-up but please keep it succinct.

Exercise 1: What are the problems in Rio Lagartos? Are they transdisciplinary?

Within each group, start discussing what problems/issues you see in Rio Lagartos. You can start from any perspective (i.e. natural, social or governance), but do it one at a time. In other words, pretend that all of you are ecologists, and deliberate what you see as problems/issues. Then you change the hat to social scientists, and

later as ‘managers’ or ‘policy makers’ (for governance aspect). Next you discuss what problems/issues belong to the overlapping areas (see diagram below and my PowerPoint, slide 13; *not included here*).

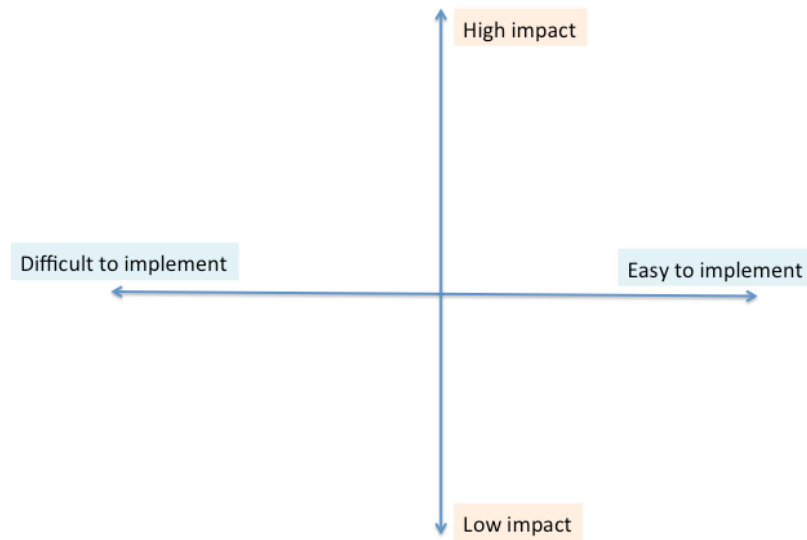


Basically, you should map the problems/issues that you see in the case study onto the diagram. You can use numbers to represent them and to indicate where they belong in the diagram (similar to the PowerPoint), following the example of how this has been done in Figure 1 in the earlier section. This will be what you submit as part of the written assignment for this unit, along with the narrative about whether the problems/issues (and which ones) are transdisciplinary in nature. Make sure you capture the notes (not verbatim, but summary) from the discussion and include them as well. Use the process explained in Box. 1 to define a transdisciplinary question before moving on to exercise 2.

Exercise 2: Prioritize the problems in order to answer the “Big Question”

“What will it take to move towards sustainable small-scale fisheries in the Rio Lagartos area?”

Here you might begin from thinking about the problems/issues you have identified in Exercise 1 and try to prioritize them in terms of what you think should be addressed first, based on two dimensions: ease of implementation and level of impact (see below). When considering impact, think about how impactful it will be in the context of sustainability if the problem/issue is addressed.



You should summarize your discussion in this exercise as Section 2 of the written assignment. Provide rationale for your prioritization and include notes about how group members differ in their opinion about what to do first.

Exercise 3: Reality check

By now, you will realize that you don't have all the information even to prioritize the questions, let alone answer the big question. You should now discuss the following and include a summary note about this in your write-up.

- What questions need to be asked and answered regarding the issues and the problems before they can be prioritized?
- Who should be asked?
- Who should actually be involved in the prioritization and in deciding if the answers to the questions are valid answers?
- Who should have more say? Who is to say who should have more say?
- Any other caveats?

Exercise 4: Let's see if we can answer the big question

Assuming that the group has reached an agreement on problem/issue prioritization (Exercise 3), discuss how you will go about addressing the prioritized

problems (e.g. what should be done and what methods/approaches/strategies to employ). You should do your best to complete this exercise, even if you feel that you do not have enough information from the case study materials to answer the questions. The point of the exercise is not necessarily about getting the answers right (who knows what the right answers are anyway?) but about how you think about the question! Include all the caveats and concerns that you may have in the written assignments, including data/information required in order to address the big question, what kind of knowledge/skills are required and who should be involved in addressing it.

Exercise 5: Group reflection

As a group, talk about the following questions and write-up a short answer to each question.

- (1) Which approach did your group take to complete each exercise?
- (2) What is the most important achievement of your group?
- (3) What are the most important lessons you learned as a group?
- (4) Was the approach taken by your group a transdisciplinary approach?

Exercise 6: Individual reflection

Each member of the group should write a short answer to the following questions and compile them as part of the written assignments.

- (1) What was the easiest task in the case study analysis?
- (2) What was the most difficult task?
- (3) What was the most frustrating moment?
- (4) What was the most important ingredient in the group work?

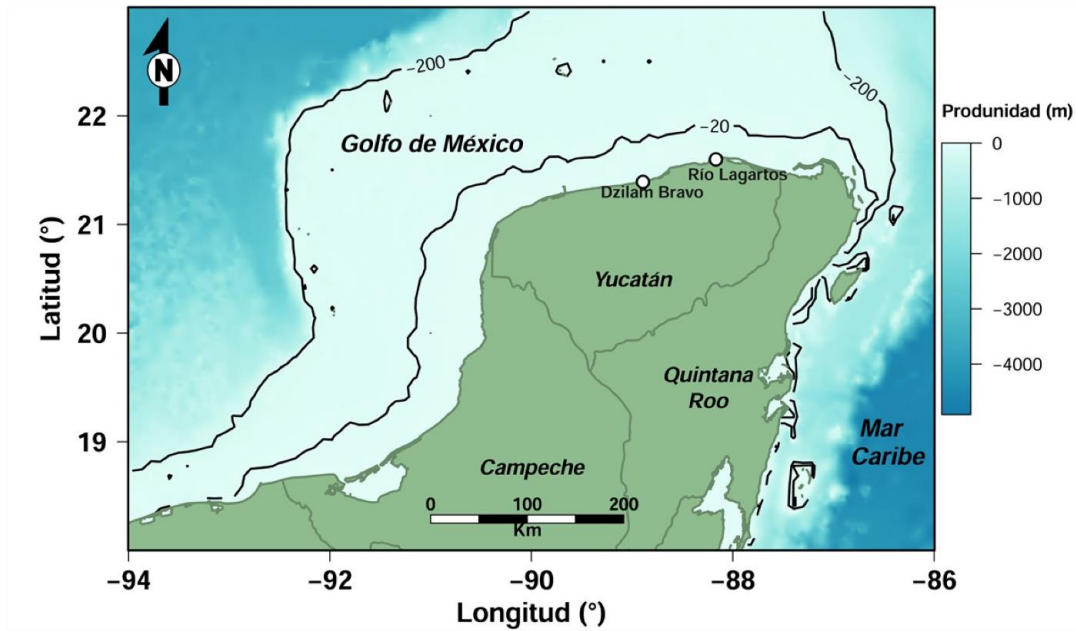
Rio Lagartos case study description

Written by Silvia Salas (Cinvestav, Mexico)

In Mexico, 90% of the national fishing fleet are small-scale, with boat length ranging from 8 to 12 meters. It is estimated that close to 300,000 people depend, either directly or indirectly, on small-scale fisheries. In the State of Yucatán, small-scale fisheries generate about 15,000 direct jobs. Fishing activity in this state is a source of employment, sustenance, and foreign earning. Due to a growing dependency on fisheries, increased exploitation and unsustainable fishing practices are causing resource deterioration and habitat destruction. This is partly due to ineffective fisheries management that fails to keep up with technology, as well as pressures arising from population growth, food demand and poverty, which don't take into account competing uses in coastal areas. The case study of Rio Lagartos is a situation that can be found in many coastal areas around the world, in terms of competing uses between small-scale fisheries and other activities and development, including conservation and tourism.

Rio Lagartos is a small town, located in the northern region of the state of Yucatán, Mexico (Figure 2.). It is situated in a lagoon, which is part of a UNESCO biosphere reserve, designated in 2004 because of the important wetlands recognised under the Ramsar Wetlands Convention. The lagoon is part of the marshes and mangroves ecoregion and is considered to be an area with high productivity and biodiversity. Rio Lagartos hosts the largest American flamingo population in Mexico during spring and summer and the coastal lagoons are frequented by approximately 388 different migratory and local bird species. In addition, the beaches act as a habitat for nesting of Carey and white marine turtles.

Rio Lagartos is known for its ecotourism, which includes bird watching, crocodile tours, sport fishing, and fly-fishing. These activities provide economic and social benefits, and they promote participation of local inhabitants in the conservation of the natural, archaeological, historical and cultural heritage of the Biosphere Reserve. Fishers in Rio Lagartos work on small boats to fish for marine species for both personal consumption and commercial sale. Catch comprises mainly of red grouper (*Epinephelus morio*), black grouper (*Mycteroperca bonaci*), sea cucumber (*Isostichopus badiionotus* and *Holothuria floridana*), blue crab (*Cardisoma guanhumi*), spider crab, locally known in Maya as 'maaxkil' (*Libinia dubia*), octopus (*Octopus maya*), and lobster (*Panulirus argus*), the most profitable species of them all. In addition to fishing and tourism, agriculture, livestock rearing, salt extraction, aquaculture and urban development also occur in the area.



Source: Courtesy Edgar Torres-Irineo

Figure 2. Map of Rio Lagartos, Yucatán, Mexico.

San Felipe and El Cuyo are nearby communities, and together with Rio Lagartos, the area has close to 7,000 permanent residents. Small-scale fisheries have an exclusive right to operate in the region and over the past several years, the fishing sector has grown in capacity and efficiency, as well as in terms of the numbers of fishers and boats, thus increasing competition for limited and dwindling resources. Rapid development in the coastal area has prompted several initiatives to help protect the rich biodiversity of these areas along the Yucatán coast. Increasing fishing pressure, declining catches, habitat deterioration, illegal fishing gears, ineffective management practices, and a surge in frequency and intensity of weather phenomena including hurricanes and red tides have brought concerns to these coastal communities and local government. Fisheries over-exploitation and environmental degradation in coastal areas usually have more to do with the socio-economic and institutional-political nature of the problems than with the resources themselves.

Limited interactions among small-scale fishers and government or other agencies make it difficult to coordinate effective management and governance action. In small communities like Rio Lagartos, it is difficult to maintain successful conservation efforts due to unclear boundaries, resource use overlaps, and weak enforcement. In addition, conflicts between users likely make the fisheries systems and protected areas ungovernable. All of these conditions increase vulnerability, affect people's livelihoods and threaten the health of the marine ecosystem and ultimately threaten the viability of the human coastal communities which depend on the marine ecosystem.

Suggested readings:

- Chuenpagdee, R., Fraga, Julia, and Euan-Avila, J.I. (2002). Community perspectives toward a marine reserve: A case study of San Filipe, Yucatán, Mexico. *Coastal Management* 30, 183-191.
- FAO. (2016). *Marine small-scale fisheries, food security, and poverty alleviation*. Retrieved February 24, 2017 from <http://www.fao.org/fishery/fishcode-stf/activities/ssf/en>.
- Fraga J., Salas, S., and Mexicano-Cíntora, G. (2008). La pesca en Yucatán: de la abundancia a la escasez, a la fragilidad de las estructuras institucionales. pp 133-148. In J. Fraga, J., Villalobos, G.J., Doyon, S. and García, A. (Eds.). *Descentralización y manejo ambiental*. Gobernanza costera en México, Plaza y Valdés (IDRC e-ISBN 978-1-55250-429-1)
- Hirsch Hadorn, G., Bradley, D., Pohl, C., and Rist, S. (2007). Implications of transdisciplinarity for sustainability research. *Ecological Economics* 60, 119-128.
- Huchim-Lara, O., Salas, S., and Chin, W. (2015). Diving behavior and fishing performance: The case of lobster artisanal fishermen of the Yucatán Coast, Mexico. *Journal of the Undersea and Hyperbaric Medicine* 42(4), 285-296.
- Instituto Nacional de Ecología. (1992). *Reserva Especial de la Biosfera Rio Lagartos*. Mexico: SEDESOL.
- Kleiber, D., Arce-Ibarra, A.M., Aylesworth, L., Barragan, M.J. , Bassett H., Castrejón , M. , Freed, S., Gonzales , M. , Govan, H., Hines, E., Hurley , M. , Isaacs, M., Johnson, A., Jones, R., Korneski, K., Léopold, M., Lewison, R., McConney, P., Moreno-Báñez, M., Orren, K., Pérez , A. I. M. , Plaan J. , Ramirez, J., Ruperti, H., Schneider, K., Simmance, A., Simmance, F., Song, A., Vessaz, F. Whitty, T., Walsh, C. and Chuenpagdee, R. (2015). Curriculum development in a transdisciplinary collaboration space. Too Big To Ignore Research Report, number R-05.1/2015, St. John's, NL, Canada.
- Kleiber, D., Arce-Ibarra, A.M., Aylesworth, L., Barragan, M.J. , Bassett H., Castrejón , M. , Freed, S., Gonzales , M. , Govan, H., Hines, E., Hurley , M. , Isaacs, M., Johnson, A., Jones, R., Korneski, K., Léopold, M., Lewison, R., McConney, P., Moreno-Báñez, M., Orren, K., Pérez , A. I. M. , Plaan J. , Ramirez, J., Ruperti, H., Schneider, K., Simmance, A., Simmance, F., Song, A., Vessaz, F. Whitty, T., Walsh, C. and Chuenpagdee, R. (2016). Developing a transdisciplinary fisheries course through collaboration. TBTI Connect; Publication series number C-01/2016; toobigtoignore.net.
- Rittel, R., and Webber M. (1973). Dilemmas in a general theory of planning, 4 *Policy Sciences*, 155-69.
- Salas S., Mexicano-Cíntora G., and Cabrera, M.A. (2006) *¿Hacia dónde van las pesquerías en Yucatán: retos y perspectivas*. CINVESTAV. 127 p. ISBN 968-5480-73-7

- Salas, S., Bjørkan, M., Bobadilla, F., and Cabrera, M.A. (2011). Addressing vulnerability coping strategies of fishing communities in Yucatán, Mexico. In S. Jentoft and A. Eide (Eds.), *Poverty mosaics: Realities and prospects in small-scale fisheries*. Springer Science and Business Media.
- Salas, S., Fraga, J., Evan, J., and Chuenpagdee, R. (2015). Common ground, uncommon vision: The importance of cooperation for small-scale fisheries governance. In S. Jentoft and R. Chuenpagdee (Eds.), *Interactive governance for small-scale fisheries* (pp. 477-493). Switzerland: Springer International Publishing.

Appendix 1

History of Knowledge according to Western science

Written by A. Minerva Arce-Ibarra (Ecosur, Mexico)

Philosophy-Science: introducing a summary of universal history and history of knowledge (according to Western science). The table also shows how science developed and how disciplines were created after XV Century with Copernicus and Galileo's Heliocentric universe paradigms.

References

- Montoya-Gómez, G., Arce-Ibarra, A.M., Hernández, J.F. and Montoya-Hernández, A. 2012. Chapter 1. Filosofía y Ciencia. Graduate course on Ecological Economics. El Colegio de la Frontera Sur. San Cristóbal de las Casas, Chiapas. México.
- Wallerstein, I. 2005. Análisis del sistema mundo. Siglo XXI Editores. México.
- Williams, M. 2016. What is the geocentric model of the universe?. Retrieved from <http://www.universetoday.com/32607/geocentric-model/>
- Web Syllabus. Astronomy 161. Copernican model: A sun-centered solar system. Department of Physics and Astronomy. University of Tennessee. Retrieved from <http://csep10.phys.utk.edu/astr161/lect/retrograde/copernican.html>

Universal History and History of Knowledge (according to Western science)

Pre-history	Ancient World	Middle Ages	Modern History (Modern Era)	Contemporary History
A period before the appearance of writing	Starts with the appearance of writing ~4000 B.C., includes earliest known civilizations, e.g., China, Mesopotamia, ~5000 years ago.	It starts in ~476 A.C., with the fall of the Western Roman Empire	It starts in ~1453 B.C. with the fall of (Constantinople) the Eastern Roman Empire	Starts with the French Revolution in 1789
	It lasted until the V Century A.C. (~ 5500 years)	Lasted from V- XV Centuries (~1000 years)	Lasted from XV- XVIII Centuries (~ 336 years)	From XVIII Century & continues until the present (227 years)
	It ends in ~476 A.C. with the fall of the Western Roman Empire	It ends ~1453 B.C. with the fall of (Constantinople) the Eastern Roman Empire	It ends with the start of the French Revolution 1789	
	-Knowledge production: around Geocentric paradigm of Claudio Ptolemy (II Century B.C.) - Earth was the center of the Universe. -Multidisciplinary scholars (from philosophy to astronomy and theology)	-Knowledge production: around Ptolemy's Geocentric paradigm -Middle ages University -Multidisciplinary scholars	-Knowledge production: around the Heliocentric paradigm where the Earth is part of the solar system (Copernicus 1543). Kepler and Galileo. -Newton's Gravitational theory -Scientific Revolution, XVII Century -Modern University -Multidisciplinary scholars (left out theology)	Knowledge production: around -Newton's theory -Descartes's reductionism -Einstein's Relativity theory -1800-1950. More Knowledge specialization. New Disciplines. "Thinking in the box" -Disciplinary scholars -1950's to 1960's First calls to multidisciplinary approaches -1970 First Interdisciplinary Conference- France -Some Interdisciplinary and transdisciplinary scholars
	Geocentric paradigm: Knowledge use and production was related to a whole, namely God (religion)-knowledge		Heliocentric paradigm: Knowledge use and production no longer was related to a God	
	Knowledge organization: Theology, Astronomy, Mathematics	Knowledge organization (two groups): 1.Trivium - Eloquence or skill at speaking: Grammar, Dialectics, & Rhetoric). 2. Quadrarium (Science: Arithmetic, Astronomy, Geography, Music)	Knowledge organization: -There was no distinction between Philosophy and Science, they formed as a whole	Knowledge organization: -Philosophy and Science split -Social sciences were formed -1970-1990 First steps toward Interdisciplinary focus -1990's to date, steps toward Transdisciplinarity

Appendix 2

Summary of the meetings with fishers in San Felipe, Yucatán during the field visit

Written by Eva Coronado and Silvia Salas (Cinvestav, Mexico)

Tuesday March 8th, 2016

Meeting with fishers from two cooperatives: '*Pescadores Unidos de San Felipe*' and '*Pescadores Legítimos de San Felipe*' (about 50 people).

(1) Organization, resources and fishing areas

In San Felipe, fishers are affiliated with two cooperatives: '*Pescadores Unidos de San Felipe*' with 97 members and '*Pescadores Legítimos de San Felipe*' with 130 members. Additionally, 10 private owners operate based on licenses ('*permisionarios*'), each one with eight or ten boats. The fishing grounds are located between 3 and 30 miles from coast. Fisheries are seasonal as shown in Figure 3.

Figure A1-1. Target species and fishing season (closed season in gray)

			Groupers, Snappers and other finfish								
Lobster						Lobster					
							Octopus				
			Sea Cucumber								
J	F	M	A	M	J	J	A	S	O	N	D

Grouper and associated species like snappers and other finfish are caught all year round, except for a one-month closure, between February 15 and March 15 (for grouper). However, since 2017 the closed season was extended to two months (February and March). Lobster has a long season of eight months, from July to February; octopus is captured from August to December. Sea cucumber is a new fishery, which began commercially in 2010 with season lasting three weeks during the year. The first sea cucumber commercial fishing licenses were approved in 2013 for a catch quota of 1,701 tons. In 2014 the authorized catch quota dropped down to 350 tons. Given the reduction

of catchable biomass on the Yucatan coast, the sea cucumber fishing area was reduced to three communities in the State of Yucatán: Dzilam de Bravo, San Felipe and Rio Lagartos.

Due to the new delimitation of fishing areas, the sea cucumber fishery has brought many problems into the community, such as excess capacity and illegal fishing that occurs during the entire year, despite the fact that the catch season last only three weeks. Illegal practices permeate the entire value chain, including harvesting, transportation, commercialization, and exporting. The controlling measures, enforcement, and surveillance implemented by the federal, state and the local governments has been unsuccessful to put a stop to the illegal practices and corruption, which is driven by the high prices sea cucumber reaches on the Asian market.

(2) Main problems facing fishers in San Felipe

Over-exploitation and interaction with large-scale fisheries were mentioned as one of main challenges facing small-scale fishers of San Felipe. Red grouper catches have been declining and the cooperatives respect the closed season, legal size, and mandatory rules for these species. However, large-scale vessels catch groupers in aggregations during spawning season and illegal fishers catch juvenile groupers near the coast. The traders and middleman buy this product regardless of when or where it was captured.

Fishers also expressed concerns about fisheries sustainability: *“the sea no longer has resources for all, we are too many people”*, and *“we are catching more than we should”*. About 50 years ago, small-scale fishing was the main livelihood, with work and knowledge transmitted from father to son and to grandson. Nowadays, the *permissionarios* treat fisheries as profit-making businesses and do not have any interest in the conservation of marine resources.

Some fishers at the meeting considered the closed seasons and fisheries policies in Yucatan to be appropriate, but the law is not applied to the neighboring states, like Campeche and Quintana Roo. They also indicated problems with fishers from these states coming to Yucatan to fish.

The sea cucumber fisheries changed the fishers' and traders' behavior and dynamic. Some fishers arrived from other states to work with *permissionarios* for the sea cucumber season. However, after the closure, they stayed in the port and some of them continue to fish without any licenses. The relationships between cooperatives, fish buyers and *permissionarios* are complicated and need to be well examined, particularly in the context of illegal fish products. A question was raised, for instance, why the authorities ignore what goes on in the fishing ports.

(3) Control and surveillance - Illegal fisheries

The issue with illegal fishing was brought up and passionately discussed. Fishers from the cooperatives believe that a census is necessary in order to know how many illegal fishers there are and how to make it evident. Legal fishers get sanctioned, but not illegal fishers, despite being reported. Fishers are generally frustrated and disappointed with the political system and ineffective management.

The major problem is the lack of control and surveillance. Ten years ago, the cooperatives had strategies for penalties and could expel illegal fishers and members of the cooperatives who carried out illegal activities. These days, illegal fishers have boats, powerful engines and guns so it is difficult and dangerous to try to patrol the area.

Some members of the cooperatives felt that the authorities wanted to eliminate the cooperative system and strengthen owners and *permisionarios*. The *permisionarios* create 'false' business and 'ghost cooperatives', and with the legal documents they can get governmental subsidies. This situation also reflects the fact that corruption is a major issue in Mexico.

(4) Changes affecting the fisheries

In the last 10 years, many changes have taken place in the area. There are declining catches, and losses of coral reefs and seagrass, leading to changes from sandy bottom into muddy bottom. Some species are no longer found in area. Red tides are recurrent - they appear once a year. When red tides occur far from the coast (30 miles offshore), the authorities are not as interested as when they appear closer to shore, especially when they are near Progreso, the principal touristic port in Yucatan.

Fishers further added that when the red tide arrives, all animals die or disappear. This often happens during the closed season of some species, which means they cannot capture anything afterwards. They suggested that the authorities should allow them to fish certain fisheries when a red tide hits the coast.

(5) Marine Protected Areas

The cooperative presidents and members were very concerned about the new large marine protected area that has been proposed to cover part of their fishing grounds (From Quintana Roo up to Dzilam de Bravo). Fishers stated that if this MPA is created, all of their fishing grounds would be affected, as well as their income. The main problem is that the government never considers fishers' opinions about the creation of the MPA; politicians visited San Felipe only to publicize the news about the creation of such areas.

Wednesday March 9th, 2016

Meeting with fisherwomen, Cooperative “Mujeres trabajadoras de Mar” (about 8 members).

(1) History

The Cooperative ‘*Mujeres trabajadoras de Mar*’ began in the 1980’s with 21 members and was founded by a widow. Today only 10 women remain as members of the organization.

The target species for the cooperative is a small crab called ‘*maxquil*’ (*Libinia dubia*) used as bait in octopus fisheries. The women catch the crab with a small fishing net that has a long handle. They catch the crab in mangroves zones near the coast. The fishing season of octopus is from August 1st to December 15th, when the crab is required for bait. The crab fishery starts at 6pm in the afternoon and ends at 5am. The crab fishery demands hard manual labor as the women walk and push the boat in areas with muddy bottom.

The women made the following statements to express their feeling about their fishing lifestyle: “*the fishery is beautiful*” “*we have the opportunity to see wonderful animals like crocodiles, snakes, and turtles.*” The women’s cooperative has respect for natural resources. For instance, they release crabs with eggs if they catch them. They consider the crab fishery to be sustainable; hence it is possible to continue this type of fishing for many years. Women sell the live crabs exclusively during the octopus season to cooperatives in San Felipe and Rio Lagartos. In addition, they sell sargo (*Diplodus sargus sargus*) to members of the San Felipe cooperatives when they don’t fish for maxquil.

There was no mention of whether the women had permits to fish.

(2) Benefits of the cooperatives

At the beginning, men disagreed with the establishment of the women’s cooperative. They thought that women did not have the ability to fish, as crab catching is a hard job. The women at the meeting mentioned that they were committed to provide bait to the fishers’ cooperative and as they did not fail, the men accepted that they could continue. Today, crab fishing is exclusive to women.

To them, working together is the best benefit because they can rely on each other. Furthermore, they are in a better position when asking for support and subsidies. In the past, they used a part of the support received from the government on reforesting mangroves after the hurricanes. But in general, support from the government rarely reaches those who need it the most and their request are often left unheard. They would

like to start a new project of nighttime tours in the mangroves for crab fishery. The idea is to offer tourists a real fishing experience in the mangroves, which would allow women not only to receive money from the tour but also to continue fishing and selling crabs. At this moment, it is not certain whether they will receive such support.

(3) Roles of research

The women mentioned that they would like to know more about crab biology, its reproduction, and life cycle. They are also interested in resource sustainability. Another possible research project, which they learned from a TV program National Geographic is about Atlantic horseshoe crab (*Limulus polyphemus*), whose blood is used for producing drugs, without having to kill the animal. Finally, they recognized the importance of research about illegal fisheries, particularly related to sea cucumber and horseshoes crab, noting that it is important that authorities are informed about these problems.

(4) Other issues

The women mentioned that four of them work with men in the lobster fisheries. They play many roles in the households, as fisher-women, mothers, and wives. They mentioned the operations by an oil company (Pemex) 25 miles from the coast, which restrict fishers from accessing the fishing grounds. They have also observed dead dolphins on the beach after Pemex started working in the area.

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This report would not be possible without the efforts of 23 co-authors from around the world. We would also like to thank additional contributors who have provided invaluable insights during various phases of the transdisciplinary course development. Special thanks goes to Silvia Salas and *CINVESTAV*, the Center for Research and Advanced Studies of the National Polytechnic Institute, for hosting the Transdisciplinary Course Development Workshop held in Mexico in March 2016. We are also grateful to our partner institutions *Centre for Innovation in Teaching and Learning*, *Marine Institute*, and *International Ocean Institute* for their ongoing support in the transdisciplinary course development.

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RESEARCH

POLICY

MOBILIZATION