

**NOAA SCIENCE ADVISORY BOARD**

**REVIEW OF THE COOPERATIVE INSTITUTE  
FOR CLIMATE AND OCEAN RESEARCH  
(CICOR)**

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**REPORT TO NOAA SCIENCE ADVISORY BOARD  
ON THE COOPERATIVE INSTITUTE  
FOR CLIMATE AND OCEAN RESEARCH  
(CICOR)**

An external panel comprised of five scientists/administrators appointed by the National Oceanic and Atmospheric Administration SAB (NOAA Science Advisory Board) performed a review of the Cooperative Institute for Climate and Ocean Research (CICOR) at the Woods Hole Oceanographic Institution (WHOI), June 15 through 17, 2005. The panel met with scientists and administrators from CICOR, Woods Hole, and other collaborating laboratories to review the research education, public outreach and management structure of the institute.

The members of the review panel were:

**Frank L. Kudrna, Ph.D.**, member of the NOAA Science Advisory Board, member of the Sea Grant National Advisory Panel and CEO of Kudrna & Associates Engineers.

**Michael J. McPhaden, Ph.D.**, Senior Research Science and Director of Topical Atmosphere and Ocean (TAO) Array Project Office at NOAA's Pacific Marine Environmental Laboratory in Seattle, Washington.

**Andrew A. Rosenberg, Ph.D.**, Professor of Natural Resources in the Institute for the Study of Earth, Oceans and Space, University of New Hampshire

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[More detailed information is contained in **Attachment 1**]

## Overview of CICOR

CICOR was established in 1998 as a Joint Institute between NOAA and the Woods Hole Oceanographic Institute (WHOI) and is operating under NOAA/OAR. The initial cooperative agreement was for a three-year period. In 2001 a new five-year cooperative agreement was signed. In addition, CICOR maintains a relationship with Great Lakes Environmental Research Laboratory (GLERL) their “host” in Ann Arbor, Michigan, the Atlantic Oceanographic and Meteorological Laboratory (AOML) in Miami and the Pacific Marine Environmental Laboratory (PMEL) in Seattle, and several other joint institutes including the Cooperative Institute for Limnology and Ecosystems Research (CILER), the Joint Institute for Marine Observation (JIMO), the Joint Institute for Marine Atmospheric Research (JIMAR) and the Cooperative Institute for Marine and Atmospheric Studies (CIMAS).

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## 1) **Executive Summary**

The Review Panel was very impressed with the scientists and the quality of the science provided to NOAA by CICOR. CICOR in its relatively short life has provided great assistance to NOAA through its relationship with Wood Hole Oceanographic Institution and partner NOAA Laboratories. CICOR has rapid response activities in the area of harmful algal blooms HAB's that could not have been implemented as quickly without the Joint Institute relationship that exists with NOAA. CICOR has also facilitated and supported interaction between NOAA and WHOI through research focuses on three science themes.

CICOR, as other Joint Institutes, has very limited Task I dollars and struggles to plan and develop new programs and support because of this limitation. Additionally, CICOR can only respond to solicitations by NOAA determined to be appropriate to be performed outside of NOAA (e.g., competitive and non-competitive funding opportunities) while its involvement in NOAA strategic planning is limited. CICOR itself needs to develop its own strategic planning strategy that can respond to and influence NOAA's strategic planning. Under new NOAA policies, all the Cooperative Institutes are to be competed on a 5-year schedule. This is a major concern for CICOR as for all other CIs. This concern exists in particular because of the importance of the longevity of the Cooperative Agreement for facilitating the alignment and deepening the research that serves NOAA mission and the considerable effort and administrative resources invested by the hosting institutes to build up the CIs.

One of the major benefits NOAA receives from the CI community is in the area of capacity building and education. In capacity building CICOR has initiated successful programs that involve national and international collaborations. These should serve as models to the CI community. The technical capabilities of WHOI are being used in service to NOAA including new instrument and platform development. Also impressive is the education arm of CICOR's host institution – WHOI. However, we believe that more should be done to expose the students to the needs and goals of NOAA and attract them to do research consistent with the latter (here of course we acknowledge that one of the limiting factors in achieving this goal is the actual amount of funding available for graduate and undergraduate studies provided by NOAA). The lack of diversity of students and staff at CICOR and WHOI is also of concern.

Finally, CICOR has over the years moved forward in engaging the broader NOAA community, such as research laboratories and line offices, to produce collaborations and joint research activities. It no doubt would increase the benefits to NOAA if the Institute continues to expand such links.

## 2. Discussion of Program Elements:

### A & B) Science Plan and Science Review

As indicated in the Executive Summary, the Review Panel was impressed with the depth and breadth of the scientific research. It is indeed world class. That means that WHOI scientists are competitive in most any environment, including its ability to compete for NOAA funding regardless of the contractual circumstances. It follows then that the function of the CI is not to improve the ability of WHOI to compete for funding but to improve the linkage of this group of world-class scientists with NOAA's mission-oriented research. It is a real asset to NOAA to maintain a Cooperative Agreement with WHOI so that it has preferred access to and, to some extent, more say about the direction of the research activity in the Institution. It is advantageous for CICOR to build better exposure to the NOAA mission needs among its members so that both WHOI and NOAA can enhance the potential of the CI.

CICOR clearly adds value to high quality work at WHOI through several mechanisms that the Cooperative Agreement facilitates:

- The CI Cooperative Agreement lowers institutional and disciplinary barriers to collaborative and/or mission-oriented research at both NOAA and WHOI;
- The administrative structure of CICOR in itself and as part of the CI community provides a conduit to NOAA and helps investigators navigate the agency;
- The CICOR Cooperative Agreement streamlines funding processes and facilitates flexibility and fast response, all of which are a huge advantage to CICOR and NOAA.

CICOR provides direct, visible added value to the NOAA by:

- Leveraging other funding sources (ONR, NSF) to facilitate a broad, vigorous research agenda.
- Taking a major role in organizing and executing government/legislative relations to support the NOAA agenda
- Providing NOAA with strong education and outreach components
- Connecting WHOI scientists to NOAA and NOAA's mission

Original planning for the CI was reflected in the MOA between WHOI and NOAA, which sets out a collection of topics of mutual interest (OAR weighted) not strategic goals. For the CI to continue to develop and evolve to the benefit of both partners, the plan needs to move to the next step of developing a strategic directions for future research aligned with NOAA's recently developed research plan.

The Review Committee is aware of CICOR's involvement across NOAA lines and notes the recent visible efforts (Ecosystem Workshop and HAB activities) but believe that there is ample potential to increase such involvement with all of NOAA's line offices and that this should be a major consideration in CICOR's future plans. To that end the Review Committee emphasizes that CICOR is a NOAA CI not just an OAR CI, and this realization is also a NOAA issue as much or more than a WHOI issue.

The Review Committee finds the planning process currently in use to be rather ad hoc and opportunistic rather than strategic. To improve the planning CICOR needs to improve the communication between the director and the research staff (fellows) and to work with the fellows to form a strategic plan. This can be facilitated by establishing protocols for regular engagement, and a process by which new opportunities are collectively discussed. As part of this effort the CI needs to develop a mechanism for the better use of the CI Fellows designation to broaden participation of NOAA researchers from all of the line offices as appropriate, help focus on strategic issues, gain better agency and organizational recognition and buy-in (e.g. from the fisheries line and the NEFSC in particular), and thereby create a stronger planning structure. The fellows program is in process of re-evaluation and we encourage the use of alternative meeting forms, greater clarity in setting the agenda and tasks for advisory board, using meetings for strategic discussions not show and tell, term limits for fellows in each theme areas.

In developing the science plan for CICOR it is important to include consideration of transition from research to operations. This is particularly evident in work related to the IOOS and other technological programs.

While CICOR's Scientific Vision is well articulated and consistent with the capabilities and strengths of the host institute, it is not balanced in terms of the actual scientific activity. Most resources are invested in climate research and little is done, in comparison, in coastal research. CICOR leadership is aware of this. The Review Panel recommends better realignment of the goals either by seeking ways to expand the activities weaker ones or by or dropping them altogether as part of a strategic plan.

#### C) Education and Outreach

CICOR has achieved much in the area of education and outreach, especially considering limited funds allocated directly to these efforts. The presence at WHOI of very strong education programs both at the graduate level through the Joint Program in graduate education in oceanography with MIT, and at the undergraduate level with the Summer Student Fellow Program creates the opportunity for CICOR to educate these high quality students in NOAAs mission. CICOR has supported undergraduate summer student fellows, and has tried to match the supported students with NOAA supported researchers. CICOR has also supported a graduate student in the Joint Program. Because the council of fellows has not been chosen with education and outreach in mind, the participation of CICOR in education and in the Joint Program in particular may be improved by more involvement of MIT faculty in the council of fellows.

Since the funds from CICOR in support of education have not been directly targeted to NOAAs mission and CICOR themes, the efficacy of their use to support NOAAs goals is unclear. Instead, CICOR may want to consider fellowships at either the post-doctoral or graduate level that focus on NOAA strategic issues and CICOR themes modeled on the Sea Grant Population Dynamics Fellowships.

Individual researchers supported through NOAA research grants administered through CICOR have been involved in an impressive portfolio of outreach activities. These efforts are opportunistic and are in general secondary to research efforts; much has been done with little

support. These efforts span the range of connection to the local schools through training of international scientists. Individual researchers have been involved in local schools and CICOR has helped to sponsor the Blue Lobster Bowl, an annual oceanography science competition among high students. The Teacher at Sea program has exposed a number of science teachers to oceanography. In addition, international connections to Chilean scientists have been facilitated through CICOR/NOAA research. A children's book that has been widely distributed has the potential to teach a large number of young children about the oceans was supported by CICOR. Finally, outreach to the community through the Harmful Algal Bloom program has potentially served to improve public health. In this area, it is interesting that connections to Sea Grant have not been made by CICOR, but this most likely has to do with the OAR focus of funded activities. The proposed effort of coordination with JIMO for the support of an outreach broker that would facilitate outreach activities that NOAA supported scientists at WHOI and elsewhere could be involved in would help with the somewhat limited scope of some of the outreach efforts.

CICOR plays an important role in the education of junior scientists at WHOI about NOAA's scientific interests. The CICOR director has made an effort to include junior scientists in planning discussions and has kept the WHOI community well informed about NOAA planning efforts and opportunities to serve NOAA's mission.

As at other oceanographic institutions, diversity issues continue to be a major concern both at WHOI and within CICOR itself. The challenge for CICOR is to determine how it can facilitate an increase in diversity within the oceanographic community with its limited budget. As CICOR broadens to include research activities not only focused on climate science, it may be possible to engage a more diverse population including those interested in the policy ramifications of the science that NOAA funds. Several opportunities include the involvement of CICOR in the possible M.S. in Ocean Technology and Policy which may draw a more diverse student body than the highly competitive Joint Program and Summer Student fellow program.

#### D) Science Management Plan

Our Panel gave very high marks to Bob Weller, Director. We felt the Director was a very active and "hands on" individual and provided good scientific leadership and help promote the activities of younger colleagues.

We felt in the future the Program should strive to support a balance of younger investigators and this should be a priority. We also felt the Program should more aggressively pursue topics and opportunities with other NOAA line offices.

The Institute seems reasonably healthy financially. It has \$110,000 in Task I funds plus 4% project development funds, which we feel is minimal in order to develop the Program.

We are pleased to see the intellectual opportunities identified through CICOR, through its hosted workshops, however it was not clear to us how the themes for these workshops were identified. Why paleoclimate is a focus for a workshop, for example, when two existing themes remain undeveloped and NOAA does not have a high priority in this area. There is a need to review the future of these undeveloped theme areas. We strongly encourage a more active and engaged Council of Fellows to provide advise and strategic planning as necessary.

We feel that recompetition is a concern that needs to be addressed not only by the Program but also by NOAA.

The issue of transition from research to operations in NOAA could be an area where CICOR could contribute. The CICOR director is on the NOAA Climate Observing System Council and contributes to these discussions. CICOR should highlight transition as an area that CICOR can contribute to, not only with regard to philosophy, but also technology for IOOS.

### **3. Discussion of Overarching Elements Contained in Joint Review Format Guidance:**

#### **A) Quality, creativity, integrity and credibility**

The Review Committee thought very well of CICOR and felt the science was creative on an individual basis but could use more creativity on a collective basis. The science was an impressive mix of contributions to observing systems such as ARGO, science in service of the public interest through the Harmful Algal Bloom program, and basic research. This science is limited both by the science in service of NOAA's mission through response of individual scientists to competitively awarded Announcements of Opportunities. The Committee felt that the CICOR sponsored workshop on Ecosystems, Climate and Policy in the Northeast in the strategic area of impacts of climate change should be commended and expanded. There were also numerous examples of creative outreach programs including the Teacher at Sea Program, the publication of the children's book, and individual efforts by CICOR scientists.

#### **B) Timeliness, scale and scope**

We believe much of the work of CICOR is extremely timely and appropriate in scale. The climate emphasis of the science and the ocean observation emphasis are critically placed at a time of growing need in federal involvement. The HAB response effort and workshop programs are also exemplary. We, however, feel that the resources of WHOI through CICOR is underutilized by NOAA

#### **C) Science connected to the application and operational implementation of policy**

The Argo project is an excellent example of satisfying this need. We also believe there is an opportunity to expand the utilization of the marine policy centers involvement with NOAA and that the Alga Bloom response is an excellent indication of application to operational implementation.

#### **D) Capacity building**

We believe Joint Institutes, through students, post-doctorates, and graduates "connect young investigators to NOAA and NOAA's mission". We also believe the



operational transition to Chile and the training of their scientists is an excellent example.

E) Education

The presence of the highly regarded Joint Program with MIT and the summer student fellowship program creates an opportunities for education of the next generation of scientists about NOAA and NOAAs mission. While some funds have been allocated to support students, its visibility could be increased among the students and young scientists at WHOI. Individual PIs within CICORs perview have engaged in outreach activities spanning from community education on Harmful Algal Blooms to the publication of a book on sea going oceanography for children. Most of these efforts are through individual researchers. The potential to increase the impacts of the NOAA funded research may be realized through a proposed effort coordinated with JIMO to have an outreach broker.

F) Efficiency

The Joint Institute process allows NOAA to achieve lower overhead rates for outside activities, providing an efficiency. WHOIs overhead rate is comparable to other institutions for experimental work, but is on the high side for analysis and modeling work. In addition, the leverage of NOAA dollars with other potential funding sources is very positive. GLOBEC is the best example of coordinating NOAA and NSF through WHOI science.

G) Social science integration

There is not a great deal of integration in this area. This is primarily a physical science program, but there are opportunities for more integration.

H) Diversity

As in most Joint Institute programs, there is need for improvement in this area. There are several possible avenues to pursue a more diverse workforce both at CICOR and for the greater oceanographic community. Engagement of students and post-docs interested in policy issues may increase diversity and CICOR may consider strategic funds to support the proposed M. S. in Ocean technology and policy that may attract a more diverse student body than the Joint Program now draws.

**4. A discussion of CICOR in relation to NOAA Research 5-year and 20-year plans, and the Science Advisory Board Research Review Committee recommendation**

CICOR's three principal themes: 1) the coastal ocean and near shore processes, 2) the ocean's participation in climate and 3) climate variability and marine ecosystem and process analysis are consistent with major topics of NOAA's 5-year and 20-year plan.

However again, Joint Institutes only have the opportunity to respond to issues determined to be of need of NOAA and some of the great potential strengths of CICOR are underutilized for this reason. If CICOR scientists were utilized more directly in NOAA planning activities, then more of the strengths of CICOR and WHOI could be brought to bear on problems relevant to NOAA's mission.

In relation to Science Advisory's Research Review Committee's external research and cooperative research recommendations, we believe CICOR is functioning consistently with NOAA's 5- and 20-year plans.

## **5. Recommendations for CICOR**

- A. Even though CICOR, located at Wood Hole, is located at the same location with the Woods Hole Sea Grant Program, there is little direct connection to Extension Outreach. It is recommended that CICOR and its NOAA partners consider a specific extension outreach element in each of its work orders and consider utilizing Sea Grant as an element of implementation.
- B. CICOR should continue to work in developing diversity within their program.
- C. CICOR should strengthen its strategic planning process to enable it to support NOAA.
- D. CICOR should seek greater and broader engagement of NOAA labs and other line organizations, especially broader engagement of the neighboring NMFS laboratory.
- E. CICOR should strengthen its Fellows committee, both through greater scheduled engagements and through broadening the Fellows committee including increasing the number of MIT faculty among CICOR fellows. The composition of the fellows committee should be flexible and based on NOAA's strategic needs.
- F. CICOR should identify those program areas where additional Task I funding would be of benefit to NOAA. Define specific funding requirements for those areas and develop a plan for how CICOR would utilize additional Task I funds.
- G. The coastal theme in CICOR is relatively underdeveloped relative to the Climate and Marine Ecosystems themes. CICOR should seek ways to strengthen its coastal programs in support of NOAA mission goals.

## **6. Recommendations for NOAA**

- A) Even though Joint Institutes have a NOAA-wide relationship, they are perceived by some parts of NOAA as an OAR entity, and are not fully utilized by NOAA. This perception is reflected in the wording of *Attachment 2 – Joint Institute Review Format*, which specifically refers to OAR but not the remaining portions of NOAA. It was also notable that OAR and WHOI

participants in the review regularly stated that CICOR was different from other JI's because it is not co-locate with a NOAA laboratory, despite the fact that the NOAA Fisheries laboratory of 200 scientists is in Woods Hole Village. Clear guidance should be reiterated by the Administrator to clarify this issue and obtain full utilization of the Joint Institutes potential. In addition, NOAA should expect interaction of CICOR with line offices other than OAR through joint planning and activities. This should be an explicit consideration in future funding decisions.

- B) It is recommended that the external review team be provided with a performance summary of task assignments by NOAA funded partners indicating NOAA's relative satisfaction with those assignments.
- C) NOAA's Joint Institute partners are greatly concerned about their future with NOAA. In addition to the Federal Register announcement regarding new competition for Joint Institutes, clear communication by NOAA of the continued need for JI's is critical. NOAA's funding of Task 1 activities was argued to be too small for the expectations of planning, capacity building and facility at education development. NOAA should strongly consider reviewing its policy for establishing the level of Task 1 funding and what it expects from providing that funding, and whether this funding should be increased on a regular basis. When NOAA begins its recompetition of the Joint Institutes it should carefully consider its request format so that it can continue valuable functions such as CICOR's HAB activity, Jason support, support for ARGO floats and other unique functions performed by Joint Institutes.
- D) The Science Advisory Board should annually review the guidance it provides (Attachment 2). A definition of terms is very much needed. For example, expressions as integrity, creativity, capacity building and efficiency and diversity were understood to mean different things by different members of our review team and clarification was not provided in the guidance. Previous JI reviews have varied greatly in the report format. It is strongly recommended that NOAA/Science Advisory Board provide a standard "template" to be utilized by review teams and provide consistency.
- E) NOAA does not have a process for input into their programming and budget activities by the Joint Institutes. It is recommended that NOAA provide the Joint Institutes an annual opportunity to present "scientific intellectual issues" to the NOAA Research Council. This would aid in achieving the NOAA Administrator's goal of funding 50% of NOAA's new research through the external community.