Draft Individual Review Form

Proposal number: 2001-B200-1 Short Proposal Title: Introduced Chinese Mitten Crab

1a) Are the objectives and hypotheses clearly stated?
Provide detailed comments in support of your conclusion

The authors state the following objectives clearly and concisely: 1) identify larval settlement patterns and peak times, 2) assess reproductive events and brooding grounds, numbers of broods per female, 3) age of maturity of mitten crabs. All are described clearly in the proposed work.

1b1) Does the conceptual model clearly explain the underlying basis for the proposed work?
Provide detailed comments in support of your conclusion

The conceptual model is "loosely" described as a "fisheries management model." They authors focus on aspects of larval settlement (although they are really looking at recruitment rather than settlement) in terms of some physical factors they believe strongly influence the magnitude and timing of settlement/recruitment. They also consider the distribution and ages of reproductive females as a way of painting in some of the information that could be useful for some management actions that might involve harvesting adult crabs in SF Bay. They also suggest the population structure of mitten crabs in SF Bay that would also bear upon future management actions, although there aren't enough data to say much. The conceptual model attempts to tie together various aspects of the life history of the crab in order to identify key features that would help to guide future management efforts. In short, the proposed work does in fact follow logically from the conceptual model.

1b2) Is the approach well designed and appropriate for meeting the objectives of the project?
Provide detailed comments in support of your conclusion

Only part of the information proposed would really be useful for any sort of future management, although all the data would certainly be of some use. The work described for the first goal will be able to describe coarse scale changes in the magnitude of recruitment, although "settlement" per se will be missed. Collectors will be checked every two weeks, which will certainly allow some ability to measure temporal changes in the numbers of megalopae on the collectors. However, recruitment of crustaceans can be very episodic with large settlement events occurring in a single day/night. Their goal (1a) of identifying the season of highest settlement will be met, but the goal (1b) of understanding what physical parameters might be driving this recruitment (e.g. low flow) will not be met. One of the key issues here is that the authors assume that all the physical parameters driving the settlement is river related. Many crabs with estuarine recruitment are closely tied into to variation in the tidal cycles. They will likely see differences between two weeks periods simply due to tidal forcing. The authors make no mention of tidal influences driving any aspect of settlement, although this is likely to have a significant influence. Even if river flow events are the driving force, the authors need to address the effects of storm events in late spring that might influence settlement and design their sampling to accommodate those events. The authors also fail to provide key details such as the depth of the sites chosen, where in each of these six sites they will establish the collectors, etc. The authors would have done well to have included at least a rough map of where this work will take place

Reproductive events are considerably less well thought out. Their hypothesis (2a) that females aggregate in specific brooding areas is likely correct, but finding these if an enormous task that would be very difficult to identify with a huge effort and not possible with the effort proposed. The proposed trawling in six regions in

SF Bay (e.g. Suisun Bay), each region by itself would be a lot of work to identify the "hot spots" for brooding females. The authors proposed three habitat specific trawls per region for each of these entire regions. Do the authors plan to identify replicate sites (say replicate shallow sites) within each region? This isn't clear from the description. Of much greater importance are the consequences of this plan for any future management. Even if the authors could identify the hotspots for brooding throughout the Bay, which is unlikely, is this key to controlling the crab. The authors state admit in the ERP goals section that the crabs might be more gathered during migration "Such migrations reduce the spatial distribution of the crabs, as the migrate form extensive freshwater tributaries to SFB." Wouldn't a better management strategy be to pick up the adult crabs at these bottlenecks than to try to vacuum (trawl) crabs from as large an area as San Francisco Bay?

The goal of identifying reproductive (2b) would add little to this. The authors state that if the crabs produce more than one brood a year, it would be advised to capture reproductive females before they release multiple broods. I agree it is important to establish if mitten crabs produce more than one brood per year. However, it is unclear why "removals would be most effective during the peak brooding period." If you remove the females earlier in the season in either case (whether they produce one or many broods), it still accomplishes the same thing. Again, capturing crabs on the way into the bay seems the best strategy.

Size at maturity (no numbered hypothesis) will also provide useful life history information. Again, all of these tasks will answer questions about crab life history, although the connection to any control program is tenuous. Knowing the life of the crab may help guide control measures, but it certainly won't frame the program in the way they suggest. If somehow we were able to completely remove a year class, then of course the number of year classes would be a key to how long we would have to remove crabs. However, any control program for mitten crabs will only be partly successful, and control will have to be undertaken EVERY YEAR for as long as the state wants to continue the program. Suggesting that there will be an "end" to any control program based on life history is misleading. Control will most likely be an ongoing operation for many years to come.

1c1) Has the applicant justified the selection of research, pilot or demonstration project, or a full-scale implementation project?
Provide detailed comments in support of your conclusion

The choice of research project is appropriate. Work on mitten crabs is really just beginning and much work needs to be done. This is the correct stage to begin with.

1c2) Is the project likely to generate information that can be used to inform future decision making?
Provide detailed comments in support of your conclusion

Generally no for the reasons stated above. The authors will likely be able to identify high vs. low periods of recruitment, but will be able to say little about the causes of variation. The authors will certainly not be able to identify the absolute hot spots for brooding females for the Bay, which would be necessary for any real control. The will be able to rank their own chosen sites in this regard, but whether these sites will represent the vast majority of reproductive females will likely remain unknown. Thus even if we were to effectively gather up the reproductive females (this part of any future management program is uncertain), where we would do this would require an enormous bay-wide effort.

2a) Are the monitoring and information assessment plans adequate to assess the outcome of the project?
Provide detailed comments in support of your conclusion

As discussed above, the plans will provide some useful life history information, but some of the key goals as stated are not likely to be met.

2b) Are data collection, data management, data analysis, and reporting plans well-described, scientifically sound and adequate to meet the proposed objectives?
Provide detailed comments in support of your conclusion

Yes, there is adequate discussion of data reporting, analysis and management.

3) Is the proposed work likely to be technically feasible?
Provide detailed comments in support of your conclusion

The work is technically feasible. Meeting the stated goals is not.

4) Is the proposed project team qualified to efficiently and effectively implement the proposed project?
Provide detailed comments in support of your conclusion

The proposed team is certainly qualified to conduct most of the sampling work. The authors have worked with mitten crabs previously and will be able to conduct the surveys and raise the crabs as needed.

Miscellaneous comments

The authors are apparently depending on MSI in Redwood City for aquarium space and trawl samples and California Department of Fish and Game as well as other "mitten crab workers" for trawl samples, juvenile crabs, etc. There are no supporting letters for any of these items so we have to take it on faith that these will be provided. A quick letter from each institution would help in the future. As advice, I point out that the authors include no budget justification, although in fairness, it is a very modest budget so I have no problem with their budget requests. Again, a map of the work sites would help a great deal. This is a sign of a hastily assembled proposal. Lastly, there is no mention of "adaptive management." While in this early stage, there is little opportunity for adaptive management, they authors might have allowed for some flexibility in their monitoring/sampling program that would be guided by initial results. My guess is that there would be significant changes in the protocols after a few months.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
☐ Excellent ☐ Very Good ☐ Good ☐ XX Fair ☐ Poor	Although some significant information will be learned about the mitten crab, I felt the rationale for the work was not well considered and that it would offer little guidance to any future management plans.