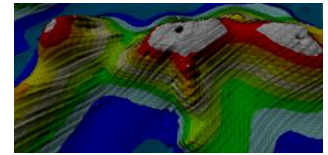**2nd Meeting of the Scientific Committee**

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Management by Seafloor Feature of Deepwater Fisheries in the South Pacific Ocean
The New Zealand High Seas Fishing Group Inc.

MANAGEMENT BY SEAFLOOR FEATURE OF DEEPWATER FISHERIES IN THE SOUTH PACIFIC OCEAN[1]

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1.   PURPOSE OF THIS DOCUMENT

This proposal of the New Zealand High Seas Fisheries Group (HSFG) describes an alternative and, in our view, improved method of management for the deepwater fisheries in the high seas of the Southwest Pacific Ocean. This document:

   i.   Outlines the proposed management regime;
   ii. Identifies the benefits and costs that would be involved in the implementation of this management approach;
   iii. Documents the role that the HSFG could undertake in support of this management approach;
   iv. Raises relevant negotiating issues and
   v.   Details actions we believe should be undertaken.

2.   BACKGROUND

The HSFG has been concerned with the manner and policy direction of the relevant interim measures, specifically,

   i.   The categorisation of certain areas of heavily trawled, lightly trawled and medium trawled blocks with fishing permitted in the first, controlled in the second and prohibited in the third.
   ii. The use of move-on rules based on threshold criteria as to what constitutes a vulnerable marine ecosystem of bycatch recovered by deepwater tows.
   iii. Interpretations as to what is a vulnerable marine ecosystem and
   iv. Failure to address relevant issues, such as resilience of deepwater benthos.

The HSFG reiterates its view that management measures should be:

   i.   Consistent with relevant and well-conceived national and international obligation

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[1] HSFG 2010. Management of Deepwater Fisheries by Seafloor Feature in the Southern Hemisphere South Pacific Ocean. High Seas Fisheries Group, Nelson, New Zealand. 20pp.
[2] Talley's Group Limited, Sealord Group Ltd, Richardson Fishing Limited, Endurance Fishing Limited, Pescatore Fishing Limited and Anton's Trawling Limited

ii.   Effective in achieving well-considered programme objectives and goals

iii. Conducive to efficient fishing operations

iv. As simple as the operational situation allows to maximize ease of compliance with conservation measures

v.   Unambiguous and not liable to subjective and/or arbitrary interpretation and

vi. Based on analyses that use *all* data relevant to the fishery.

The assumptions implicit in this document are as follows.

- The purpose of the fishery is to produce food, provide employment and create economic benefits. Thus, the objective of management should be to create maximum sustainable (welfare) benefits by ensuring that fishery yields are sustained at high levels and ensuring the sustainability of populations and communities of animals that co-occur with the fisheries (i.e. on seafloor features).

- ***All*** useful and available information, current and historical, are used in making decisions regarding the fishery - often paraphrased as "use the best available scientific data". There seems no reason to restrict or place 'windows' on the data used in preparing management protocols.

- HSFG's vessels undertake precision fishing operations: they use 'leading-edge' technology in their aimed or directed trawling and in recording of where fishing occurs: positioning errors are trivial. Usually only a minor part of the habitat of benthic ecosystems on any one bottom feature is contacted by the fishing gear.

4.   WHAT DOES MANAGEMENT BY SEAFLOOR FEATURE INVOLVE?

4.1   Existing Fishing Operations and Management Areas

Fishing by HSFG vessels is prosecuted exclusively on specific, identified, bottom features. If there is no indication of fish on the echo sounders or catch rates are uneconomic, the vessel proceeds to another seafloor feature. Operators record catch and effort details by feature name along with the geographical coordinates – a requirement of their fishing licence along with other obligatory information. Large amounts of data exist in the New Zealand Department of Fisheries database.

Information has conventionally been analysed by rectangular areas (20' x 20'). The practice of using rectangular reporting areas is extensive – found around the world, especially for high seas fisheries – and, no doubt, reflects the past lack of accurate navigational capability and because it also reduces locational precision. These arbitrarily-designated rectangles bear only a general relation to the existence of seafloor features. A single rectangle may include one seafloor feature or many. It may have extensive areas of deep sea floor (i.e. ≈ 4000m) or very little. Equally, the size of such rectangular management areas has an administrative, rather than scientific, basis. The areas may or may not bear a relationship to the stock structure of targeted fish populations or the 'connectivity' of benthic populations.

4.2   Nature of the Objective

HSFG believes there are many potential advantages from designing a management system whose basis are the seafloor features about which fishing is centred.

Potential for Management Measures to Reflect Unique Characteristics of Each Seafloor Feature

Each seafloor feature is unique. It will have its own physiography – size, orientation, bottom type, depth, latitude and longitude, and thus position in a seawater mass and current regime. While many, if not all, benthic

species may be found on other nearby seafloor features, and some globally, we expect that their relative abundance will vary for any number of reasons. As fishing vessel operators, we know that individual seafloor features vary in the frequency with which commercially-viable fish concentrations are present, their seasonality and species composition, though a fully satisfactory understanding of these phenomena appears still somewhat distant.

It seems axiomatic that the ability to tailor fishing and conservation regimes to the extant characteristics of each seafloor feature offers many advantages. Where there is little or no interest from a commercial fishing perspective, conservation regulations may be designed that do not have to compromise their objectives for socio-economic reasons. Likewise, if specific areas are characteristically known as good fishing areas, they may be designated as fishable and not be subject to potential restrictions on fishing because of unpredictable stochastic events that have high commercial costs.

To summarize, we see the following desirable possibilities.

- Ability to close specific seafloor features to fishing (e.g. because they have important benthic populations that may be damaged by fishing, have rough/rugged bottoms that prevent fishing, never have commercially viable fish aggregations, or whatever).
- Ability to design conservation measures that specifically reflect that the faunal characteristics of the particular seafloor feature, e.g. in pursuit of 'representative' conservation objectives
- Ability to tailor the closure of areas of a seafloor feature where there are, or it is believed that there may be fragile benthos that may be damaged by fishing gear
- Ability to facilitate fishing in areas where it is possible while ensuring conservations requirements are satisfied by closing and protecting other areas where there is no interest in fishing - a *win-win* outcome.
- Should discrete fish populations have a defined relation to specific seafloor features management measures may be designed that are stock specific to optimize the benefits obtainable from stock/population specific fishing operations, e.g. benefiting from assumptions concerning spawning stock size and recruitment
- Generally, allowing fisheries management regimes that approach optimality in terms of accepted management objectives through application of specific management protocols.

5.   MANAGEMENT COMPONENTS
5.1   SCALE OF THE TASK
The exact number of seafloor features that have been fished by HSFG vessels in the Area has yet to be documented though Clark *et al.* (2010) list 59 – see Appendix I. But, this can be verified without great difficulty. Table 6.1 lists the numbers of features given in Ministry of Fisheries reports.

Allain, Kerandel & Clark (2010) have reviewed the number of seamounts in the SPRFMO area. They refer to 1451 features being higher than 1000 m in the SPRFMO area. Of these they note 205 seamount peaks are between 500 and 1500 m, the depth range that would provide potential habitat for some demersal commercial species. They also note that the list could be augmented by the inclusion of 1611 seamounts (Wessel 2001) and by the addition of 756 underwater features higher than 1000 m in height. They note that 34 256 underwater features smaller than 1000 m in height noted by Hillier and Watts (2007) should also be considered. These additional seafloor features may not attract fish aggregations, but they would provide habitat for cold water corals and similar benthos.

Table 6.1
Number of Seafloor Features by Major Fishing Area: [1]Table 2 of Penny (undated) and [2]Table 16 of MoF (2008)
Appendix I lists 59 sea floor feature given by Clark *et al.* (2010)

Fishing Area	[1]No. of seafloor features fished	[2]No. of blocks		
		Light	Medium	Heavy
South Tasman Rise	-			
Lord Howe North	3	8	9	5
Lord Howe South		12	5	6
Northwest Challenger Plateau	14	9	20	29
West Norfolk Ridge	10	6	7	4
Three Kings Ridge		6	7	4
Louisville North	11	7	7	10
Louisville Central	10	6	13	7
Louisville South	6	6	3	7
Total fished features	**54**			

5.2   Protection of Fragile Benthos

Characteristically, only a part of a seafloor feature is suitable for trawling, either because of the bottom gradient or irregularities. The fraction of fishable area is highly variable – industry estimates range from 5% to 40%, but this information needs to be confirmed on a feature-specific basis. This has been done for the areas of New Zealand's SPRFMO footprint. Vessels usually fish along specific tow paths and if these areas were inhabited by fragile benthos (e.g. emergent cold water corals) they would have been destroyed. Two issues arise from this.

First, videos of seafloor features show that all seafloor features are not uniformly covered with 'coral forests' or 'coral gardens' or other characteristic benthos. This is not unsurprising - different areas of seafloor features would vary in their habitat characteristics and thus their quality as a benthic habitat. Corals are passive feeders: they rely on currents to bring them food. Areas of enhanced currents, e.g. seafloor ridges, may provide more desirable habitat than areas with lower current flows. Emerging results from direct observations are showing more the opposite – seafloors characterized by generally bare areas of rock.

Second, it is difficult to conceive that the removal/destruction of a small fraction of the benthos (even as great as 40% should it be) threatens the 'ecosystem' that the corals comprise or the ecosystem(s) in general associated with the seafloor feature. Sometimes, large emergent corals can be detected with the vessels' acoustic systems and an appropriate 'no-fishing in that area' strategy can be implemented.

5.3   Concerns with Current Management Practices – The 20' by 20' Management Blocks

The interim measures implemented by the NZ Department of Fisheries use rectangular management units of 20' of latitude and 20' of longitude (= 20 nautical miles in the case of longitude). The use of marine rectangular areas defined by convenient numbers of degrees and/or minutes for fisheries reporting is a long standing practice. In earlier times, such areas were sensible: they often applied to fisheries that were prosecuted over fairly extensive areas, precise navigational aids that would have permitted accurate position fixing were unavailable and the extended areas from which data was reported provided a convenient means of obscuring exact fishing locations (despite this, it is well known that deliberate area-misreporting was wide spread).

While adoption of rectangular summary areas for management purposes is consistent with the area-based management practices characteristic of the last century, the HSFG believes this practice forgoes many benefits. The use of rectangular reporting areas may mean that a single rectangle may contain several seafloor features that are/can be fished and which differ in their characteristics in providing habitat for benthic fauna and their fisheries productivity. Or, they may define areas of no management interest or relevance. Further, block-based management is not consistent with HSFG fishing practice that has been followed for over two decades, the distribution of the fishery populations, or the assessment methods that have been commissioned and accepted.[3]

The HSFG is also concerned about how closed areas, open fishing areas and conditionally open fishing areas have been defined. These concerns arise from uncertainties as to the suitability of the data that were used in making the classifications and the arbitrary nature of the basis for decisions regarding what areas should be unconditionally open to fishing and what areas should be subject to move-on requirements if there was 'evidence' of a vulnerable marine ecosystem. Further, the HSFG believes that this method is not the most effective for ensuring conservation of fragile emergent benthos. Fishing may be permitted in areas that provide good habitat for fragile emergent benthos and efforts to control it may be desirable (and would be encouraged by the HSFG). Further, the control on fishing in the 'medium' areas is such that expert decision makers are unlikely to have the information they need to determine if that area should be protected from fishing in the future – in which case the decision, which is implicitly scientific, may be made on subjective or political grounds. For these reasons, the HSFG believe that management on a sea-floor-feature by sea-floor-feature basis is more rational and will result in better fisheries management (see Section 4.2).

5.4   Video Recording of the Seafloor in Fished Areas with Potential Coldwater Coral Populations
Some fishing companies are investigating using videos to determine the nature of the seafloor, before, during or after fishing. It has often been the case that benthic organisms are remarkably absent in fished areas and the presence of targeted species is not associated with areas of abundant coral growth when they occur on the same sea-floor feature. The potential use of video recorders offers an interesting possibility to determine if the gear may cause 'significant adverse impacts', especially when small amounts of coral are returned in the trawl catch that trigger a decision that they are evidence of the existence of a 'vulnerable marine ecosystem'. The HSFG believes that this is an area that should be investigated.

5.5   Fishing on Known Features Currently Excluded under Interim Measures
HSFG vessels have fished seafloor features across the Southern Pacific Ocean and we urge this be recognized in agreeing on what have been historical fishing practices. These areas were primarily fished by New Zealand vessels starting during the mid-1980s.   HSFG supports a formal analysis of the likely sustainable yield from the features fished during this period. The HSFG can provide information on these past fishing practices and catches. HSFG encourages a review of all catches by all the vessels of all participating states be undertaken (has this been done?) and identification of past catches by seafloor feature be undertaken. This should include identification of past bycatch of fragile benthos by seafloor feature.

6.   FEATURE-SPECIFIC MANAGEMENT
HSFG proposes a new management method for the deepwater fisheries based on feature-by-feature protocols. Much of the necessary information for this exists and its detail permits mapping of benthic bycatch, especially as usually highly-detailed acoustic observations of seafloor topography are also recorded. Areas where fishing may

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[3] For example: Clark, M., M. Dunn and O. Anderson (2010).

be permitted and/or areas known to be important coral/sponge habitat can be mapped. Fishing in areas known to be habitat for fragile benthos can be prohibited to achieve conservation objectives.

Management measures may be specific for particular seafloor features, e.g. fishing season, species-specific TACs, bycatch regulations, etc. Seafloor features may be aggregated into clusters for resource assessment and TAC management purposes either because the range of a stock encompasses several seafloor features or because insufficient information exists to confidently permit seafloor-specific management measures in a particular area to embrace an entire population/stock. Thus, seafloor-specific measures may encompass those traditionally used:

- Dates of opening and closing of the feature-specific season
- Feature-specific TACs
- Defined/permitted areas of seafloor features on which fishing operations are permitted
- Feature-specific requirements for special data collection, e.g. video recordings (along specified tracks), biological sampling needs, etc.
- Type of fishing gear to be used – in appropriate circumstances HSFG members would share their extensive knowledge on best gear and rigging specifications for specific seafloor features
- Best times and conditions to fish certain features to optimize fishing operations.

Feature-based management has a logical basis for ensuring the protection of populations of fragile benthos and offers several advantages to the arbitrary Vulnerable Marine Ecosystem Evidence Process. The basis of Feature-Specific Management is simple: ***areas are either open or closed to fishing***. Closed areas may consist of entire features but HSFG expects that closed areas would primarily encompass:

i.   areas that cannot be fished because of the bottom topography or depth,
ii.   areas that have never been of commercial fishing interest and
iii. areas known to provide important habitat for fragile emergent benthos.

Feature-specific regulations would be subject to on-going review and would consider e.g., observers' reports and/or whether an area was known to have been subject to considerable fishing in the past. Feature-specific management would require collaboration between fishing operators, especially skippers and fishery managers and regulators. Fishing and 'no-go' areas will need to be mapped and to a large extent the required data to do this exists in companies' records. An accurate survey of past fishing activities is needed and this information might helpfully be available in geographical information systems. Targeted catch and bycatch analyses would be on a feature or feature-group basis. If non-HSFG operators participate in the fishery a joint approach must be negotiated with equitable sharing of management costs and fishery benefits. An opportunity exists to embrace leading-edge management strategies that make use of evolving leading technology in fishing and related documentation of fishing practices.

Clarity, Simplicity and Compliance
It is well understood by fisheries regulators that simplicity of regulations leads to effective compliance and efficient enforcement. With precisely defined fishing and closed areas, vessel officers know exactly where and where not their vessel can fish. Highly secure locational monitoring systems (VMSs) with rapid and variable poll rates means that enforcement can be highly effective and compliance will be high if not complete. Operators welcome well-defined regulations as opposed to unscientific, contrived and arbitrary procedures that always invite cheating/evasion and partial enforcement. Regulators should feel the same.

7.   HSFG Participation on Resource Assessment

HSFG cannot see how vessel-independent (acoustic) resource assessment surveys can be justified on a cost-benefit basis. The natural solution is to require the vessel operators to undertake this obligation *as a condition for participation in the fishery*. The field of commercial-vessel aggregation-based stock assessment is well developed and scarcely controversial. It is past time when a working group should be formed of those competent in this field to design, negotiate and implement such a programme in the SPRFMO area.

Commercial-vessel aggregation-based stock assessment is naturally seafloor-centric because fish aggregations occur in association with seafloor features, or at least, that is where they may be acoustically assessed. This is a fundamentally compelling reason supporting the concept of management on a seafloor-specific basis.

HSFG operators are open to undertaking acoustic stock assessment surveys that are designed on a feature-specific basis designed in conjunction with stock-assessment scientists. Such surveys would be integrated into commercial fishing operations. While this may require stopping fishing operations it may also be the only way the required information can be assessed. The collection of acoustic information on a site-specific basis could provide an invaluable source of time-series information on the distribution and abundance of targeted fish populations.   The extent of post-cruise involvement and funding in data analysis is a matter for future negotiation. HSFG welcomes formal or informal discussions of this possibility – at this meeting – and underlines the relation between their contributing to responsibilities for fisheries management and the role of operator entitlements and rights in this fishery.

8.   PROGRAMME ELEMENTS

Implementing Feature-Based Management in the Southwest Pacific Ocean could involve the following.

   i.   A review of the catch and effort data for the entire history of the fishery with past and present vessel skippers and operators to determine if the existing catch record accurately reflects the history of the fishery and to identify the feature-specific fisheries record.
   ii.   Past trawl fishing effort that has used extensive rather than aimed-trawling should be reviewed on a feature-specific basis. These two groups of data should have different CPUE characteristics and it may be appropriate to analyse the two groups separately.
   iii. A review of possible past misreporting, primarily by feature, should be undertaken to improve data reliability. This may assist in relating past catches to specific seafloor features and to identifying areas whose catch history has been wrongly recorded.
   iv.   A database should be developed to permit feature-based identification of catch (weights and species), effort and seafloor feature information. Such a database should record where fishing is not possible and/or areas that might be closed to fishing for conservation.
   v.   An interactive exercise with relevant vessel officers to:
        a.   identify areas known to have fragile emergent benthos
        b.   document relevant knowledge and experience relating to targeted fish behaviour and distribution.
   vi.   Discussions and agreement on whether different information should be collected during future fishing campaigns to enable better fisheries management and
   vii. Development of industry-led resource assessment surveys.

9.   DISCUSSION

Skippers have every reason to avoid catching fish-damaging and/or gear-damaging benthos. As part of the proposed management protocol, prior to each voyage fishing plans should be reviewed and information on the

presence/absence of coldwater corals noted to ensure that fishing operations will avoid areas fished where they are known to occur. Skippers involved in the HSFG are among the most experienced deepwater skippers in the world having fished on the high seas in all parts of the globe. They are committed to sharing their experience with other member of the group and other parties that fish on the high seas - subject to defined protocols regarding the dissemination of sensitive data -, especially in a management structure that provides appropriate incentives for responsible fishing.

10. LITERATURE CITED

Allain, V., J.-A. Kerandel & M. Malcolm Clark 2010. Potential seamount location in the South Pacific RFMO area: prerequisite for fisheries management and conservation in the high seas. Secretariat of the Pacific Community. SPRFMO-V-SWG-05. 18pp.

Clark, M., M. Dunn & O. Anderson 2010. Development of estimates and sustainable catches for orange roughy fisheries in the New Zealand region outside the EEZ: CPUE analysis and application of the "seamount meta-analysis" approach. New Zealand Fishery Assessment Report, March 2010 – released under the Official Information Act.

Hillier, J.K. & A. B. Watts 2007. Global distribution of seamounts from ship-track bathymetry data. Geophysical Research Letters (34): 13.

MF 2008. NZ Ministry of Fisheries 2008. Bottom Fishery Impact Assessment. Bottom Fishing Activities by New Zealand Vessels Fishing in the High Seas in the SPRFMO Area in 2008 and 2009. 102pp.

MF 2010. New Zealand National Report on Fishing and Research Activities in the SPRFMO Area in 2009. Ministry of Fisheries. SP-09-SWG-05. 11pp.

Penny, A. 2010. Use of geospatial data and predictive habitat models to evaluate the likelihood of presence of vulnerable marine ecosystems in the SPRFMO Area Ministry of Fisheries, New Zealand. SWG-09-DW-03. 12pp.

Penny, A. Undated. Overview of Best Available Scientific Information on Orange Roughy Sustainable Catch Limits in the SPRFMO Area. Ministry of Fisheries, New Zealand. 11pp.

Wessel, P. 2001. Global distribution of seamounts inferred from gridded Geosat/ERS-1 altimetry. J. Geophys. Res. 106(B9), 19,431-19,441.

A p p e n d i x I
Southwest Pacific Ocean P h y s i c a l   C h a r a c t e r i s t i c s   o f   S e a m o u n t s
(Clark, Dunn & Anderson 2010)

IFA No.	Region	Latitude	Longitude	Summit (m)	Elevation (m)	Area (km2)
1	West Norfolk	-33.98	167.50	915	335	15.0
2	West Norfolk	-33.60	167.80	830	370	4.9
3	West Norfolk	-33.83	167.84	966	534	40.0
4	West Norfolk	-33.23	167.54	450	1050	50.0
5	West Norfolk	-33.75	167.27	250	450	50.0
6	West Norfolk	-33.78	167.38	480	270	10.0
7	West Norfolk	-33.27	166.96	540	210	7.5
8	West Norfolk	-33.09	167.04	450	250	25.0
9	West Norfolk	-32.74	166.94	230	470	55.0
10	West Norfolk	-32.57	166.83	480	270	27.0
11	NW Challenger	-37.34	168.05	695	255	4.2
12	NW Challenger	-37.48	167.68	595	365	4.0
13	NW Challenger	-37.47	168.64	899	101	1.0
14	NW Challenger	-37.81	168.14	609	191	1.0

15	NW Challenger	-37.19	167.23	606	394	4.0
16	NW Challenger	-37.25	167.29	822	178	1.5
17	NW Challenger	-37.31	167.27	578	322	4.0
18	NW Challenger	-37.36	167.57	874	126	1.0
19	NW Challenger	-37.60	168.47	752	148	1.5
20	NW Challenger	-37.89	166.97	1187	163	16.0
21	NW Challenger	-37.86	166.99	1242	108	1.5
22	NW Challenger	-37.35	168.14	940	80	1.3
23	NW Challenger	-37.33	168.02	898	77	1.1
24	NW Challenger	-37.32	168.01	923	52	0.6
25	Lord Howe	-35.65	165.97	772	428	5.0
26	Lord Howe	-35.61	165.96	807	393	3.0
27	Lord Howe	-35.97	166.18	920	280	11.8
28	Louisville (S.S)	-50.50	220.80	540	3660	1331.5
29	Louisville (S)	-48.20	211.20	490	4310	1739.1
30	Louisville (S)	-47.90	210.30	1090	3710	550.3
31	Louisville (S)	-46.10	205.70	590	4110	1148.1
32	Louisville (S)	-46.20	204.10	590	4210	1739.1
33	Louisville (S)	-45.40	202.40	540	3860	2201.0
34	Louisville (C)	-44.00	199.30	740	3260	1148.1
35	Louisville (C)	-43.70	199.00	1010	2690	434.8
36	Louisville (C)	-43.50	198.50	690	3310	1331.5
37	Louisville (C)	-42.80	198.00	810	3690	679.3
38	Louisville (C)	-42.30	197.20	655	3845	2717.3
39	Louisville (C)	-41.90	196.40	918	3082	679.3
40	Louisville (C)	-41.50	195.70	785	3216	3912.9
41	Louisville (C)	-40.90	195.00	662	3338	244.6
42	Louisville (C)	-40.70	194.60	620	3380	332.9
43	Louisville (C)	-40.40	194.30	1070	3080	332.9
44	Louisville (N)	-39.90	193.90	1410	2580	679.3
45	Louisville (N)	-39.70	193.70	1375	1625	169.8
46	Louisville (N)	-39.60	193.40	1385	2415	332.9
47	Louisville (N)	-39.10	192.60	880	3652	2717.3
48	Louisville (N)	-38.40	192.00	274	4507	3288.0
49	Louisville (N)	-37.70	191.00	1085	-1085	434.8
50	Louisville (N)	-37.50	190.70	1035	3613	332.9
51	Louisville (N)	-36.90	190.20	955	3868	1148.1
52	Louisville (N)	-35.60	189.80	1210	4076	434.8
53	Louisville (N)	-35.40	189.60	980	3920	679.3
54	Louisville (N)	-35.00	189.20	1390	4052	244.6
55	Louisville (N.N)	-34.70	189.40	1150	3950	244.6
56	Louisville (N.N)	-33.70	188.60	1250	5070	978.2
57	Louisville (N.N)	-33.40	188.60	1430	3670	550.3
58	Louisville (N.N)	-32.50	188.20	1490	3500	679.3
59	Louisville (N.N)	-31.40	187.80	1135	4390	3912.9