

Report of the Meeting of the Ad Hoc Working Group on Coordination of Tagging Information (online, 5 July 2024)

The results, conclusions and recommendations contained in this report only reflect the view of the Ad Hoc Working Group on Coordination of Tagging Information. Therefore, these should be considered preliminary until the SCRS adopts them at its annual Plenary meeting and the Commission revises them at its annual meeting. Accordingly, ICCAT reserves the right to comment, object and endorse this report, until it is finally adopted by the Commission.

1. Opening of the meeting

The meeting was held online on 5 July 2024. It was opened by Dr Andrés Domingo (Uruguay), who indicated that he was acting as Interim Coordinator only for this meeting until a permanent coordinator was appointed. The ICCAT Assistant Executive Secretary, Dr Miguel Neves dos Santos, welcomed the participants, and highlighted some logistical aspects. He explained that although the meeting was not originally included in the annual calendar, following the SCRS Workshop, it was decided that it was necessary to reactivate the Ad Hoc Working Group on Coordination of Tagging Information (the “Group”).

The SCRS Chair, Dr Craig Brown, explained the objectives of the meeting and noted that the various Species Groups had indicated that it was very important to reactivate this Group for SCRS activities and development of the research programmes.

2. Nomination of Rapporteur(s)

The ICCAT Secretariat (Ms. Marisa de Andrés) served as Rapporteur.

3. Adoption of the Agenda

The proposed meeting agenda was adopted (**Appendix 1**). The List of participants is attached as **Appendix 2**. The List of meeting presentations is attached in **Appendix 3**, and the respective summaries are included in **Appendix 4**.

4. Brief historical overview of ICCAT tagging programmes

The Secretariat gave a presentation that provided a historical overview of ICCAT tagging activities (SCRS/P/2024/082). It indicated the various ICCAT research programmes related to both electronic and conventional tagging, as well as the number of tags deployed by them, including the number and type of tags deployed and recovered by species. ICCAT has developed tagging activities since 1979 and its database contains information on more than 700,000 conventional tags deployed and about 54,000 conventional tags recovered. Approximately 1,500 ICCAT electronic tags have been deployed. The rewards system and the annual lottery of recovered tags held during the SCRS plenary sessions were also mentioned.

The Group discussed conventional tags and the low recovery rate, indicating the need to improve tagging programmes, particularly with regard to tag recovery. The positive effect of the Atlantic Wide Research Programme for Bluefin Tuna (GBYP) on tag recovery was also mentioned, and the decline that is observed in conventional tagging in general. All participants agreed on the importance of this tool. Some design issues related to conventional tagging activities and the importance of robust and scientifically sound experiment designs were also mentioned.

The presentation SCRS/P/2024/084 delivered by the Secretariat focused on ongoing activities related to electronic and conventional tagging databases, their maintenance, and improvement of mapping and tools to view data (dashboards), as well as cross-validation of the United States and ICCAT Secretariat’s conventional tagging databases. The data confidentiality policy on tagging data was also emphasised.

During the discussions, it was suggested to collaborate with other international acoustic tagging networks outside of ICCAT (e.g. European Tracking Network (ETN) and Ocean Tracking Network (OTN)) to facilitate the work, as they have a large number of signal receivers in the Atlantic Ocean and adjacent seas. It was indicated that ICCAT does not currently use acoustic tags, but that this could be reconsidered in the future. Other important aspects of the discussion concerned the need to carry out more in-depth analyses by fishery for a better understanding of tagging data. There was consensus that all SCRS tagging groups should work in close coordination with the Secretariat, and that the Secretariat should provide the support essential to these groups.

5. Current ICCAT tagging programmes (developed activities, SCRS advice produced, products produced, problems and proposals for future tagging activities)

The presentation SCRS/P/2024/090 provided an overview of the shark tagging programme within the Shark Research and Data Collection Programme (SRDCP). One of the SRDCP's main activities has been tagging, addressing habitat use, distribution, and post-catch mortality. To date, 117 ICCAT electronic tags have been deployed on various shark species and in different areas of the Atlantic. A total of 276 tags have been deployed in collaboration with other programmes. While the main species on which research work with satellite transmitters has been conducted is shortfin mako shark (SMA), with a total of 52 ICCAT tags, work has also been done on other shark species (POR, BTH, ALV, OCS, SPZ, SPL, SPK, LMA, and FAL). The activity carried out in 2024 within a specific electronic tagging campaign (miniPATs) was mentioned, in which, in addition to sharks, species from other programmes (SWO and BIL) were tagged. The difficulties related to transmission failures, which are probably due to battery problems and have been observed since 2020, were also noted. It was indicated that the most problematic tags seem to be those from 2021-2022, which could bias results. Other aspects highlighted were some post-tagging mortality events that would be associated with certain species. Information was presented on the use of data obtained from tags in different SCRS processes, particularly in stock assessments and scientific contributions submitted to the SCRS, including various publications in peer review journals.

The Sharks Species Group Rapporteur supplemented the presentation with information on conventional tags deployed on sharks and the activities developed to date.

The Group assessed the activities carried out and the results obtained. As regards conventional tags deployed on sharks, it was understood that tagging needs to be increased and the long-term importance of these programmes was highlighted. There was discussion on how to optimise some data to derive greater benefit from the information (e.g. how the tag was deployed, when, etc.) and to validate the quality of the data collected. While much conventional tagging is opportunistic, it still provides important information, particularly in terms of displacement and growth. It was indicated that scientists need to provide feedback to the ICCAT Secretariat to enable improvement of the databases and their viewing tools.

With regard to conventional tagging of sharks, it was noted that the recently purchased tags do not seem to be fully suitable as the stainless-steel tips are completely straight, lacking the curvature necessary for the applicators to be inserted and the tags deployed. In principle, it would be necessary to bend by hand the tips of the tags, one by one, which is odd as it is time-consuming and could cause damage. This should be taken into account when purchasing tags in the future.

A general presentation was given on the billfish tagging programme (SCRS/P/2024/089) within the Enhanced Programme for Billfish Research (EPBR). The objectives of this programme, which was launched in 1986, include the use of conventional and electronic tags to generate important information for management of these species. While most of the tagging has been carried out in the western Atlantic, satellite tagging started in 2023 in the eastern Atlantic. It was indicated that one of the problems was low volume of tag transmissions and battery problems, leading to data gaps. Another problem was premature tag shedding. It was also indicated that much of the tagging within this programme takes place at fishing tournaments, which limits tagging to some areas.

The Group discussed the possibility of adding to the ICCAT databases information from other programmes, particularly from the United States, which is already being done, and reviewing historical data.

The presentation SCRS/P/2024/091 gave an overview of the Swordfish Species Group's tagging activities within the Swordfish Year Programme (SWOYP), which started in 2018 and has deployed 40 ICCAT tags to date. One of the main objectives is to determine the boundaries of the three stocks currently defined, as well as patterns of movement and habitat use. The Group's activities and achievements were presented, according to the information obtained from transmitters. It was noted that the data could potentially be biased due to high rates of battery and tag failures, especially since 2021.

The Group Interim Coordinator indicated that one of the immediate objectives was to make a decision on satellite tags (particularly the Wildlife Computers miniPAT model) and funding for purchase of the tags, given the uncertainty due to the transmission failures of tags programmed for one year that have been observed in some campaigns.

The Group agreed to have a more general discussion on this issue at the end of the presentations. All the efforts made were appreciated, as was the importance of having accurate information on tag operation.

This was followed by a general presentation on albacore tagging (SCRS/P/2024/092). Initially, a brief overview was provided on how the Albacore Species Group uses conventional tagging information. Data obtained from conventional tags were used *inter alia* to estimate the northern stock growth curve and mortality. Attention was then turned to the Atlantic Albacore Tuna Year Programme (ALBYP), which focuses mainly on the Northeast Atlantic, although it was indicated that it is intended for tagging to start in both the Northwest and South Atlantic. 41 pop-up tags and 116 internal archival tags were deployed during the 2019-2024 period, and the data are providing valuable information on stock distribution.

All the work is regarded as very positive considering the difficulties of the species. Transmitter size and the possibility of using smaller devices, which could have less effect on the individuals' behaviour, were discussed.

Supplementing the above information, an analysis of the operation of pop-up tags was presented (SCRS/P/2024/093). Of the 14 tags deployed in 2022, nine failed (64%) for various reasons. A comprehensive analysis of the possible causes was carried out.

The Group agreed that tagging efforts are very significant and costly in relation to the value of the tag, which is already considerable, and that these levels of malfunctioning are highly detrimental to research programmes and the SCRS in general. It was again indicated that due to the smaller size of the species, smaller transmitters may be required to prevent tag shedding.

The need was raised to separate the technical failures of the tags from shedding rates, which in some cases are very high (e.g. because they are deployed on small specimens), as, although both affect the performance of tagging programmes, they are independent problems. In any case, it was clear that the tags are not working as they should, and are failing more, especially in data transmission, which was particularly apparent in the 2021-2022 period (see below SCRS/P/2024/086).

In the presentation SCRS/P/2024/083, the Secretariat presented data from the Atlantic Ocean Tropical Tuna Tagging Programme (AOTTP) (2016-2020). This specific tagging programme succeeded in deploying almost 119,000 conventional tags and recovered about 16,500 tags for the three species of tropical tunas (BET, YFT, SKJ), which corresponds to 58% of the total tags deployed by ICCAT on those species. In the case of electronic tags, a total of 599 internal archival and pop-up tags were deployed. A large amount of data was collected over a wide area of the Atlantic Ocean, using tags from various companies. It was also noted that there were a number of problems with tags during the programme.

The Group discussed the general need to define the objectives of the tagging programmes and their intended use, and to look at information gaps in order to improve the programmes. Given the breadth of the programme, it would be important in the future to carry out an analysis of the problems and difficulties encountered in order to be able to evaluate the programme and have input for future activities.

In a broader discussion of all the programmes, the idea was proposed to produce a document that details the information needs of each group which could be obtained from the electronic transmitters, as a basis for discussion with the supplier companies. While the idea was considered positive, the need to consider in detail the tagging objectives of each of the groups was raised, to establish common ground.

A presentation of the bluefin tuna tagging programme within the GBYP (SCRS/P/2024/085) was then given, and it was indicated that the main objective is to provide information on the spatial distribution of Atlantic and Mediterranean bluefin tuna for management purposes. A total of 38,472 tags of different types (37,740 conventional, 663 pop-up, 61 internal archival, 8 acoustic) were used. This programme involves a considerable number of ICCAT scientists and work has been carried out with many institutions and two workshops on different aspects of tagging have been held. Problems with pop-up tags were indicated, such as technical problems and premature tag shedding. Current and potential uses of the data and plans for the short term were also referred to.

The Group noted that there are a number of factors to consider when discussing tagging issues. It was noted that the size of the fish certainly matters, but also that there are many manufacturers, and that some tags are programmed by the supplier using customer specifications, and that others can be programmed directly, etc., i.e. failures cannot always be attributed to the supplier. There may be problems with a batch of tags, or there may be a specific problem with one species. Other participants indicated that the worst period for problems with tags seemed to be from 2020 to 2022, but that by 2023 the quality of the Wildlife Computers' miniPAT tag transmissions seem to have improved.

Finally, another presentation was given by the Secretariat on the problems observed in the transmission quality of ICCAT pop-up tags (SCRS/P/2024/086). It was noted that initial problems with data transmission were observed in 2018-2019. Although Wildlife Computers indicated that the problem had been resolved, problems were again detected in 2022 and in 2023 Wildlife Computers fully acknowledged that there was a problem with the batteries and requested that the Secretariat return its remaining tags for a tagware upgrade to prevent this problem. As compensation it sent various (goodwill) tags free of charge and replaced 90% of those that have had transmission failures. Subsequently, the company implemented a stricter protocol for tag retention. Almost 50% of the tags deployed in 2021-2022 failed, but a more detailed analysis indicates that 100% of the tags deployed in cold waters worked, while in temperate waters many failed. In 2024, the Secretariat conducted a first comprehensive analysis to determine the performance of new tags received and deployed in 2023, which was presented at the SCRS Workshop. Some possible strategies were presented to advance on tagging issues and overcome the disadvantages currently observed. The main measure is to reactivate the Ad Hoc Working Group on Coordination of Tagging Information, and to start using more acoustic tags, considering the wide network of receivers in some areas. Other strategies would be to consider double tagging with internal archival and acoustic tags, using goniometers for pop-up tag recovery, and using tags from other suppliers.

The Secretariat indicated that Wildlife Computers has acknowledged that there were problems with batteries in recent years and that an urgent decision needs to be taken at the SCRS plenary sessions. Furthermore, as regards funding, a CPC that makes a voluntary contribution has indicated that it will no longer provide funds for tags that do not work, and therefore a decision needs to be taken urgently.

6. Draft proposal of workplan for the Working Group

A draft Workplan was presented which indicated that the first action needed is to appoint a Coordinator, given that this Group is very important. It was noted that hybrid meetings may need to be held in the future, one or more depending on the evolution of the Group. The draft included recommendations for the Workplan, as the Workplan should be developed by the Coordinator.

It was agreed that the first activity of the Ad Hoc Working Group should be the drafting of Terms of Reference for the Ad Hoc Working Group, given that tagging is pervasive across many SCRS groups and that there have been problems not only with tags but also with procedures. Moreover, some concerns were raised about the potential overlap of this group with the research programmes of each Species Group and that this overlap may undermine the independence of the SCRS Species Groups.

In addition, the importance of horizontal collaboration across all the groups carrying out tagging work was noted. It was agreed that the reactivation of the Group is necessary and that it is necessary to draft Terms of Reference defining the objectives of the Group and the relationship of the Group with the Species Groups. It was emphasised that the purpose of the Group is to address all points common to the tagging activities of the different species and to help to solve common problems, without overlapping with the other groups.

It was suggested that the rapporteurs of the various Species Groups define the types of tags that need to be purchased for the tagging activities to be carried out. The Secretariat indicated that the groups are free to decide the tagging activities to be carried out, but in the case of satellite tagging activities, these must be approved by the SCRS as all the tags are purchased together and the money must be spent before the end of the year.

It was explained that GBYP funds, as in the case of other groups, must be spent in 2024. However, the GBYP specifically has carryover from the previous year which must be spent in a month, and therefore it is not possible to wait until September. One participant indicated that this situation could be a good opportunity to investigate other possibilities, such as acoustic or internal tags, which could be a safer investment while the situation of pop-up tags is clarified.

The SCRS Chair asked those present to inform him if they could coordinate the Group. He further indicated that it would be difficult to hold a hybrid annual meeting given the number of meetings. It was also noted that if the intention is to reactivate the Group, it should be included in the calendar of meetings drafted at the SCRS plenary sessions.

It was indicated that the Species Groups rapporteurs could meet before the Species Groups meetings (in September 2024) to determine which tags (other types, other suppliers) to purchase. The Secretariat again indicated the need to make a decision on how to use the money available in September and noted the possibility of holding a meeting of the Group on the Saturday of the week of the Species Groups meetings. The SCRS Chair indicated that this could perhaps be solved by correspondence; proposals could be submitted within 20 days and once the proposals have been received, a short online meeting could be held. No decision was taken on this matter.

It was advised to consider the establishment of an external experts committee to advise ICCAT, however there was no agreement on this. It was also unclear who these experts would be, as within the ICCAT structure it is the SCRS that has the expertise to directly provide advice to ICCAT.

7. Recommendations (to the Species Groups and the Secretariat)

The Group recommended that, in the case of the GBYP, tagging with Wildlife Computers miniPAT pop-up tags should continue in the future, given the positive results obtained in the North Atlantic, although measures should be taken to minimise the failures observed in other areas such as the Mediterranean, and appropriate compensation should be negotiated with the manufacturer should transmission problems persist due to poor battery performance in certain scenarios.

The Group recommended that the 2024/2025 electronic tagging programmes by the different Species Groups be maintained and that the Secretariat in collaboration with the SCRS Chair negotiate with the main provider for purchase of the latest version of the pop-up tags that show improved performances, and securing appropriate compensation if problems are detected. At this stage, it seems that even with all the issues, the Wildlife Computer tags are still the ones with the best performance, and there are some indications that the most recent tags that use the latest tagware, if stored with the latest protocols, seem to be performing better.

The Group recommended to the ICCAT Secretariat to continue analyzing the tag performance statistics and report back to the SCRS, to the Species Groups, as well as to this Group in future meetings. At this stage all ICCAT tags metadata have been provided by the manufacturer to the Secretariat. There is considerable work that needs to be done on that database, but it will be extremely important and useful for future decisions to use those meta-data for an in-depth analysis of the tags performance over time, including the number of messages transmitted, number of days transmitting, percentage of data transmitted, etc. Ideally, an update on this work would be presented in September at the SCRS meeting.

8. Other matters

No other matters were raised.

9. Report and meeting adjournment

It was noted that the report would be adopted by correspondence and that it needed to be adopted as soon as possible. The Interim Coordinator thanked all participants and adjourned the meeting.

Agenda

1. Opening of the meeting
2. Nomination of Rapporteur(s)
3. Adoption of the Agenda
4. Brief historical overview of ICCAT tagging programmes
5. Current ICCAT tagging programmes (developed activities, SCRS advice produced, products produced, problems and proposals for future tagging activities)
6. Draft proposal of workplan for the Working Group
7. Recommendations (to the Species Groups)
8. Other matters
9. Report and meeting adjournment

List of participants*¹

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Appendix 3

List of presentations

<i>Doc Ref</i>	<i>Title</i>	<i>Authors</i>
SCRS/P/2024/082	Overview on ICCAT tagging: an historical perspective	Anonymous
SCRS/P/2024/083	Overview on ICCAT tagging of tropical tunas (AOTTP)	Anonymous
SCRS/P/2024/084	Ongoing activities on ICCAT tagging database	Anonymous
SCRS/P/2024/085	Overview on ICCAT tagging of bluefin tuna (GBYP program)	Anonymous
SCRS/P/2024/086	Summary of problems affecting performance of pop-up satellite tags deployed within ICCAT etagging programs	Anonymous
SCRS/P/2024/089	ICCAT billfish tagging: overview of the tagging activities in the EPBR	Coelho R., Rosa D.
SCRS/P/2024/090	ICCAT sharks tagging: overview of the tagging activities in the SRDCP	Coelho R., Domingo A., Forselledo R.
SCRS/P/2024/091	ICCAT swordfish tagging: overview of the tagging activities in the SWOYP	Coelho R., Rosa D.
SCRS/P/2024/092	Albacore tuna tagging within ALBYP	Arrizabalaga H., Cabello M.
SCRS/P/2024/093	Pop-Up tags' malfunction analysis in the ICCAT albacore research program (2019-2022)	Cabello M., Arrizabalaga H.

SCRS presentations abstracts as provided by the authors

SCRS/P/2024/082 - The Secretariat briefly presented an historical perspective of conventional and electronic tagging updates within past and current ICCAT tagging programmes managed by the Secretariat and other national programmes reported to ICCAT. This included a summary table of conventional tagging, detailing the total number of tags released (700,000) and recovered (54,500) for each of the main ICCAT species. A great range of recovery rates was observed, ranging from 2% of Atlantic white marlin to 23% of bigeye tuna, with an average for all species of 8%. The Secretariat provided information on the number of conventional tags available at the ICCAT Secretariat that can be provided to national tagging teams for deployment within ICCAT tagging programmes. Additionally, the Secretariat informed the Group on the current rewarding activities, based on the type of tags recovered, as well as other activities that promote tag recoveries, such as the annual lottery held since 1990 during the SCRS Plenary meeting.

SCRS/P/2024/083 - The Secretariat provided a presentation on the progress of the ICCAT conventional tagging on tropical tunas with a particular focus on the tagging related activities throughout the AOTTP project. That included the number of releases and recoveries for skipjack, bigeye tuna and yellowfin tuna, differentiating those from AOTTP from other tagging programs. For AOTTP, density of releases and recoveries in 5x5 squares were provided. A summary of geographical data on tropical tuna conventional tagging was also shown, including release location and apparent movement for the three tropical tuna species. Additional information was also provided in terms of the number of days at liberty, including maps of apparent movements for the recaptured specimens after more than 4 years at liberty. Special reference was made to a bigeye tuna captured after more than seven years at liberty (2,604 days). Information on the 599 electronic tags deployed by species within AOTTP was also provided, including figures for the different electronic tags deployed by species within AOTTP. The Secretariat also informed the Group on the tag seeding experiments carried out during AOTTP by recovery teams in Senegal, Côte d'Ivoire, EU-Spain, and Ghana, as well as the progress to date. Additionally, it provided an overview of the ongoing activities on maintenance and development of the tagging database by the Secretariat, aiming for the dissemination of available data collected within AOTTP. The Group was also informed that the AOTTP Symposium webpage now has links to most of the presentations made (<https://www.iccat.int/aottp/en/aottp-symposium.html>) during that final event of the programme carried out in 2020.

SCRS/P/2024/084 - The Secretariat provided information on the ongoing improvements of all the conventional tagging data gathered in the ICCAT tagging database, which will continue and run in parallel with the maintenance and improvement of the conventional tagging database (CTAG) and the development of the new database on electronic tagging (ETAG). The ETAG project's main goal is to integrate all information obtained from electronic tags and the associated metadata into a centralized relational database system (PostgreSQL). The Group was also informed about the type of communication and dissemination of data, that includes an Excel file with the main information, as well as useful tools that have recently been created to visualize tagging data (dashboards or map viewer). Reference was also made to the rules and procedures for the protection of, access to, and dissemination of data compiled by ICCAT. A reference was made to the information (Excel, dashboard, and mapviewer) currently publicly available on the ICCAT website. Finally, the Secretariat informed the Group on the current difficulties in incorporating conventional tagging data reported by the USA (for the period 2009 and 2019) and on the collaborative ongoing activities to solve the issues in the medium term, that involves the Secretariat and USA tagging correspondents, who are working on the full cross-validation of both conventional and electronic tagging databases, with the main objective of correcting all discrepancies and missing information across all species. As a result, the tagging data on swordfish, blue marlin, and yellowfin tuna have already been revised and the data on conventional tagging, made available by the National Oceanic and Atmospheric Administration's (NOAA) Cooperative Tagging Program and the Billfish Foundation, has already been incorporated into the ICCAT database.

SCRS/P/2024/085 - An overview on ICCAT tagging of BFT (GBYP programme) was provided by the Secretariat, including an introduction, a brief summary of the history of BFT tagging activities in relation to ICCAT, and a general description of the GBYP e-tagging programme (objectives, data sources, number and type of deployed electronic tags, contracts and MoUs signed under the programme, detailing the number of tags deployed by year and geographical area). Other activities related to the GBYP tagging programme, such as the organization of *ad hoc* workshops and the recovery programme, were also enumerated, as well as the general problems that had affected the development of the programme, and the general results and current and potential uses of tagging data for BFT management purposes were summarized. Finally, the short-term plans of the GBYP tagging programme were presented, including both field activities and those related to data management and dissemination of results.

SCRS/P/2024/086 - The Secretariat provided a summary of technical problems that have affected the performance of the Wildlife Computers PSATs, the most widely used within ICCAT e-tagging programs, in recent years. This includes: i) referencing some background documents, such as the reports of GBYP and SCRS workshops in which this issue had been discussed; ii) the different problems observed between 2018 and 2023; iii) the measures taken to prevent or minimize them were enumerated in chronological order; iv) explanations on the current situation, including the results of the battery tests performed prior to deployments carried out after the implementation of the new protocols for tags maintenance and the very preliminary analyses of the performance of the tags deployed from 2023, already fitted with a tagware specifically designed to prevent battery passivation; and v) a series of possible strategies to address the current problems and research needs were proposed, and the decisions to be taken in the short term by the SCRS Groups were recalled.

SCRS/P/2024/089 - *Summary not provided by the authors.*

SCRS/P/2024/090 - *Summary not provided by the authors.*

SCRS/P/2024/091 - *Summary not provided by the authors.*

SCRS/P/2024/092 - Some of the uses to which conventional tagging data has been put in the Albacore Species Group were presented. The review is not exhaustive but provides some examples. For example, data obtained from conventional tags were used to estimate the growth curve of the northern stock currently in use. An attempt was also made to estimate natural mortality, and the data were included in the Multifan-CL assessment model. Regarding electronic tagging, the presentation gave a brief overview of the ALBYP, focusing mainly on the Northeast Atlantic, where 41 pop-up tags and 116 internal archival tags were deployed during the period 2019-2024.

SCRS/P/2024/093 - Esta presentación incluía un análisis del funcionamiento de 14 marcas pop-up implantadas en el 2022 en bonito del norte (ALB) de las cuales 9 fallaron (64%) por diversas causas. Se realizó un análisis exhaustivo de los posibles motivos prestando atención a los gráficos de movimiento vertical de los peces, en los que se pudo concluir que las marcas presentaron fallos de diversa índole como el sensor de temperatura y el de presión, el pin del anclaje roto, fallo de detección de suelta prematura y fallo de transmisión de datos (no report).