

New method of inspecting tuna, fresh fish, vegetable, and fruit quality, deep-ocean water that applies medical treatment supersonic wave technology, quality improvement by natural energy by temperature management, and research paper of quality maintenance management circulation

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1 Introduction

The tuna is judged with ultrasonic diagnostic equipment for the medical treatment. This research that starts a cold glance from surroundings being bathed in reaches the end goal, and has shifted to the quality improvement, the processing using the natural energy of the next step, and the storage method, etc. It is difficult to ascertain very bad of an internal fleshy substance from externals when the tuna judges. A high, cheap ingredient, and an intense price at vertical intervals and the quality criterions are often seen the priced situation in the quite different world and are the quotient materials with a high risk the price the tuna business defective goods and doing because of opening of senior goods and the tuna that judged. the tuna an unstable quality Dealings based on established grounds are not performed. Then, the tuna that queued up in the wild variety of parsley by applying the medical treatment ultrasonic diagnosis technology was inspected. Because the clinical trial result that a current judge concept can be changed was obtained, it reports. The judgment of tuna's scorch is basically impossible in the supersonic wave. Because necessarily it is because of dependence on the evaluation original person's standard by the naked eye judge, and even if it is high, accuracy is not corresponding to the scientific grounds standard.

It is called the root of the development of ultrasonic diagnostic equipment for the medical treatment is a fish finder. why it is a supersonic wave The medical treatment ultrasonic diagnostic equipment and the technology rapidly do the advancement development, and have already become necessary indispensable to the medical treatment image diagnosis. Heat of temperature of cancer cell treatment and gene insertion that sees rapid development by up-to-date supersonic wave technology in field where expectation was not done and uses ultrasonic microscope and thermal index reversely in realm of healing, it is a supersonic wave massage, [bikaoutsuwa], an enzymic activity, and a restraining device, etc. in an industrial relation in health appliances such as the supersonic wave motor with high accuracy, the washing machine, the humidifier, the disinfection device, the levitation devices, and the structure

nondestructive testing equipment. When it is possible to use it well, the ability that these can be done with one device combining it is kept secret.

When the tuna was judged, the image analysis on supersonic wave data B modal method was constructed, and being possible the collection to come was emphatically analyzed and an original inspection standard was constructed. When it undertook these inspection standard and display evaluation, it verified it based on the supersonic wave data and the result where fishcuting actually existed. Information said to be a comparatively useful when the past was judged was tempered, described, and the quality improvement technology construction was examined in addition based on those information. In addition, the adaptability of newly developed commodity epoch 1000i made by supersonic wave nondestructive testing device OLIMPAS company that was able to be operated the device even if a specific license was not possessed and the examination as the

I introduce the status of progress about these about this device because I achieved applied very high result though it is a research early stage.

2 Purpose

The one is evaluated by one tuna observation in crack respect of externals and the tail as for tuna's quality rating at the point that queues up in the wild variety of parsley. As a matter of course, because this judges an internal fleshy substance that controls the qualities most from the face, the gap tends to grow as for the hit. As for the price, gambling is high and the vertical interval is intense. The sensibility of judge of those who compete is controlled and what quite different from the fair price to the quality exists, too. Be apply the medical treatment ultrasonic diagnosis technology to these, the most important in tuna's quality with the ultrasonic device, and in observing the deep fleshy substance that is the alien territory and assuming the reference of the quality rating (The ultrasonographic observation of the human body is applied), the accuracy of the judge was improved, the failure was reduced, and it was assumed to be the final purpose to stabilize the bid finally according to the evaluation display based on the scientific basis. The construction of original tuna's ultrasonography standard was assumed to be the first purpose for that. However, the consumer displays a final quality standard with they it depresses to the construction of the quality improvement improvement plan of the tuna assumed to be a low quality such as the tunas burnt due to the quality control and the judge failure according to the evaluation, the construction of remedial measures is assumed to be the second purpose, and constructs the form that selects and consumes the quality of the favor with the display because he or she can become incomplete only by it.

3 Method

Information on externals etc. that are a usual judges (putting, amount of mucus, pattern, luster, bloodshed amount, blood characteristic on landing ground, weight, and tuna's kinds, hows to wring it, and surfaces of externals, and cell construction and tastes in crack respect of the tail) is collected. Crossing information is collected running through the body (muscle plate) usually similarly since running through and crossing information of the blood combination on ..saying.. [suji] are collected from four tail side horizontal finger, and the observation position is moved from pinna pectorale inferio in the ultrasonic device (five references) next from the position to upperback in addition. This was assumed and both sides assumed doing to be a routine. the ultrasonic frequency and the observation cooking stove and did the detailed observation according to the situation. Finally actual depth crack respect was confirmed afterwards (Attendance is personally basic), it accumulated in the data base, and it analyzed it based on these information. In quality degradation tuna [mishitsu], the research for the quality improvement using deep-ocean water is accompanied and it does. (It is a reference as for book tuna's science.)

3-①Past judge method

As for the tuna, in the photograph that lines up like this in the auction market, the tuna is a small-scale fishery cooperative wild variety of parsley and characterizes and queues up high big and small and unevenly by about 100 about the freshness of the day trip usually. The judge that considers this characteristic begins.



The tuna of several days queues up in the following photograph by about 300 after the tuna where it is medium-scale and comparatively becomes complete the size queues up and it catches it. Here is needed in consideration of another characteristic for the judge, too.



The vessel name and the number that queues up are confirmed before the judge starts and it records. After that, it advances to a strict judge.

The granting disregarding by the judge is done while taking the competition with other brokers into consideration so that this may choose the best of one from among that.



The overall externals are observed. Especially, the feeling of curving presence of the curve like the shade and shape, etc. and direction and putting condition is examined.



The shape variation on the surface of the shade of the cut of the tail is observed.



Tuna's state of the skin is seen.



The state of the skin is seen parting again.



The first dorsal fin is seen. It stores it.



It projects.



An angle and an optical addition and subtraction are changed and the cut of the tail is observed again. The shade presents vermillion with a bright, transparent feeling, and the reflection to light admits a strong upheaval of the cut weakly.



The viscosity of the body is felt and the texture of the examination taste etc. is felt. There is a fiber crumble, and it is acid a little.



Properties of blood are examined. The blood corpuscle element is kept, and cohesiveness is comparatively shown in bright vermillion, and the smell is a fresh smell. The quality recovery can be expected of blood where it lives.

Because the probability of stocking with the tuna that corresponded as it is analyzes an internal fleshy substance high only by a certain meaning face, it is necessarily the severe world where the person's capability, sensibility, and fate are controlled though the day after tomorrow's landing expectation and price on order will be put in the mind the market situation and tomorrow, the tuna is judged, and it chooses, it competes, and the good one of the quality is stricken.

Then, an internal fleshy substance not to be able to have done the seen thing up to now is confirmed by the supersonic wave and it stocks with the tuna with high quality by increasing volume of information. 100% is impossible, and the certainty rises. It has the information power that can work a change for other business and work. The reason that should be the supersonic wave depends on the reason why an effective inspection method anymore and a standard value that not is cannot be found. Therefore, it is necessary to construct the method of inspecting the supersonic wave quality.

Naked eye judge data base input item

| | | | | | | | |
|--------|------------|-------|---------|-------|--|------|-----|
| 検査日付 | 2009/08/27 | 測定 本数 | 洋鰯魚茶葉魚苗 | 00 | 検査者名 | | |
| 被検品名 | ヒラマグロ | 測定ID | F00001 | 結果 | 良 | 結果番号 | 箱実九 |
| 取扱方 | 石巻 | 評定 | 良 | 内観評定 | | | |
| 取扱方 | 直送、胸つけ網。 | 評定 | 良 | 内観評定 | 抜けなし、色合い薄い、両側背骨に二んにやくを20 パーセント程度縮域性に認めら | | |
| 外観形状 | 相状正 | 評定 | 良 | 内観コード | 2301343134 | | |
| 外観表面状態 | 無傷あり | 評定 | 良 | | | | |
| 外観表面特徴 | 2L | 評定 | 良 | | | | |
| 外観表面 | 細いベニつき銀色 | 評定 | 良 | | | | |
| 外観形状 | 異音なし | 評定 | 良 | | | | |
| 外観表面特徴 | 両側 | 評定 | 良 | | | | |
| 外観表面 | 腹膜むずか | 評定 | 良 | | | | |
| 味 | 苦い | 評定 | 良 | | | | |

内観内観評定
骨力化および剥れ骨に二んにやくを縮域性に認めら
骨側に認めない。

内観評定サンプル写真

3-②Supersonic wave judge method

3-②aTuna's anatomy and physiology necessary for tuna's ultrasonography
And, the law and politics type presents the streamline as for tuna's shape as shown in photograph 1. It is covered with the scale of the diameter about 3mm on the body surface and the lower layer protects the body by a hard skin. The skin on the surface of the head district is made a cartilage, and sticking of the ultrasonic probe worsens. Moreover, lying such as [kiteko] is a difficult area for the impedance match for the multiple reflection noise to appear badly and to observe most. It ..scorch of the problem.. ..height.. leaves for the depth in this area right under. When it was possible to stick, the thickness was a level that the decrease of the ultrasound transmission doesn't become a problem in 5MHz band probably because of the unit of μm it in the scale 3mm as for the ultrasonic probe. However, there was a necessity for axially inclining the ultrasonic beam by the influence of the lepidosis. Sets of muscular fibers of the diameter about 1mm postponed to the spaghetti externals columnar in 40-kilo weight of the object are seen in the structure that [suji**] wraps the muscular paragraph thickness 10mm and the structure of tuna's fleshy substance is arranged from the head to the tail evenly and in parallel like the concentric circle. The element compositions such as the protein, moisture, fats, and iron contents are said that there is no difference between the muscle and the soft parts organization of the human body with the ratio. Therefore, it is expected that the scanning technology of the human body that the soft parts organization observation and is not the great difference can be applied. It is necessary to consider it most, and moreover, the tunas maintain to about 34 degrees in the self-temperature as well as the mammal and take part in the thermal regulations most as biological knowledge by the blood combination. (document tuna's science reference)
heart beat in the state of [kaketa] as for graze intoxication. [yaitohata] in additionIt is thought that the tunas do not have the difference in the heart beat value either. Therefore, the blood pressure rises when the ventricular rate goes up and it is thought that the temperature rises (The outcome of an experiment and the method in Fisheries Experiment Station on February 11, 2005 are the blood flow measurements by the supersonic wave color Doppler person). It runs away as a process where the heart beat rises at the time of catching, a desperate momentum that goes mad is raised, it accompanies it, and the kinetic energy of the muscle and the bone becomes the source of heat, too. This is suggested that it is not adjusted as being the blood combination and it causes the heat generation according to the movement. (It seems that it is possible to understand from the phenomenon of heat's going up to the level by which the burn is caused by generating heat when the bend is quickly descended, the wire etc. are bent,

and it operates.) Even the canned tuna level in a strong for that a scorch tuna causes the thermal change of the body. The part touches the spine in the center part of back Naka. As for oil, it melts, it infiltrates the fleshy substance, and I feel good unexpectedly the scorch sore acidity is weak local the body of tend of blood like the blackening powder. There is a state called a scorch whose Acidity is stronger than the thermal change that gives out a foul stench at time. Either is sore of being the blood combination, the shade of ..saying.. fleshy substance is ..blood combination.. light, there is opaqueness, and the softening tendency is shown. Moreover, the muscle causes the flaking off tendency and [****] of the showing exudate is caused. Blood shoots the hemolysis tendency and the nasty smell of showing is shot. The greening tendency is shown in the naked eye (The [surufumiogurobin] change took part according to the document).

3-②b

Photograph1



As for this area, the supersonic wave is not penetrated easily because of the cartilage, and the probe sticking is also bad.

To high-speed swim, the scale is axially arranged in an orderly manner.

There is a remarkable directive property in the ultrasonic reflection to the scale.

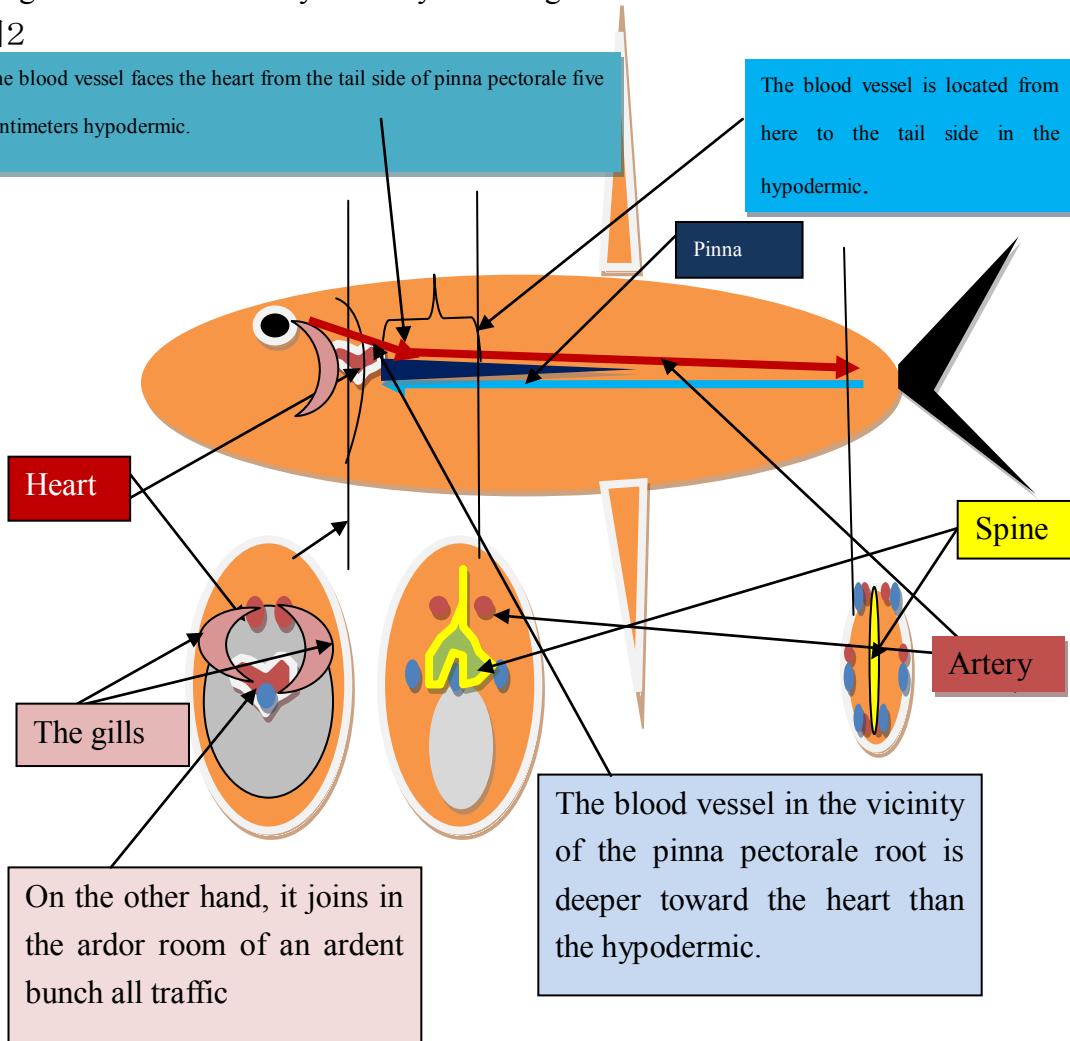
3-②c Tuna's blood vessel anatomy outline chart (Figure2)

As for the heart, blood is exhausted to a red artery through the gills and distributed by one-way traffic right and left. As for the heart, blood is exhausted to a red artery through the gills and distributed by one-way traffic right and left.

図2

The blood vessel faces the heart from the tail side of pinna pectorale five centimeters hypodermic.

The blood vessel is located from here to the tail side in the hypodermic.



It is thought that the place and timing change according to the situation though it decks about the shaking ship and it is necessary to cut the blood vessel main surely as a matter that I would like you to examine it from Figure 2. The business field is thought to be fisherman's area. It is given priority not to do, and to preserve impossible treatment in Ramble promptly if the situation is bad. A lot of getting cold ice too much that is shows the counterproductivity, and the Ramble water quality deterioration due to hemorrhage ..cytocalasis.. becomes arrogant though it depends on the temperature of the processing tuna as an environment of Ramble. The partial pressure of oxygen takes part in this, the oxygen demand increases to impure Ramble water, the tuna skin cell causes breathing difficulties, the causing self-digestion promotion is caused, the water quality deteriorates in addition, the oxide of nitrogen by the oxygen deprivation, especially the generation of ammonia is promoted, and, in addition, the cytocalasis is promoted. These phenomena are thought to be difficult prevention even if deep-ocean water is added, and the supplemental oxygen by the replacement and the air pump use for the water of Ramble becomes important processing work that should be performed. (The business is assumed to be an action to which thought action and work are decided and as for discretion and work, everyone is long ages possible with stability.)

3-②dTuna's cross section (Figure 3) is shown.

The spine divides oval shape to the tuna section. It is divided to the back side and the belly side further by blood combination and muscle.

Concentric circle is observed respectively in the section on the back side and the belly side and it arranges it to the shipshape evenly. The muscle plate is composed of sets of the muscle fibres and the fascias is boundary . It bunches from the starting point to the terminal in the shape of fibre of an immovable caliber by the same caliber, and wraps the fascias and, in addition, is wrapped in the muscle fibre like the concentric circle in the muscle plate. Therefore, if abnormality doesn't exist in the muscle fibre, the line of parallel smoothness is presented. The epidermal of back Headside and the chest sheath is made a cartilage hard and the ultrasound transmission is bad.

Figure 3

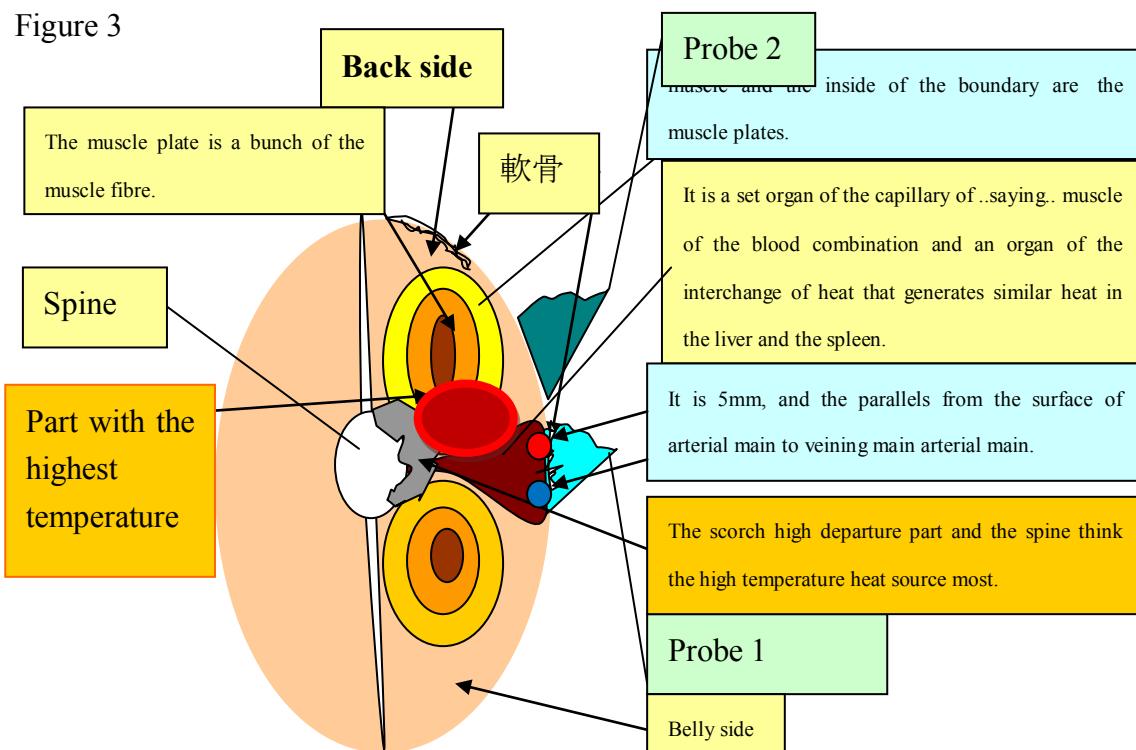


Image of probe 1

Blood combination
It observes it by
the low echo.

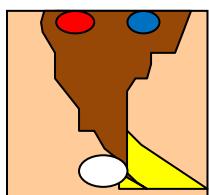
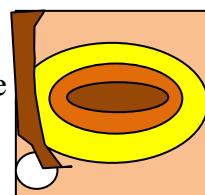


Image of probe 2

The most much observation
The direction attention of scale



The echo pattern it is the blood combination is usually indistinctly observed further as muscle of the high echoing zonal by a slight, crude high echo image though is a convenient display, and muscle of a high plain echo to the uniformity of low echo meat or the meat of no echo is usually observed as a thin line as for red meat. A muscular

boundary of the low echo made indistinct a little is observed as a heavy line (so-called reverted image) and the ultrasound transmission shows the decreasing tendency in a high crude echo not uniform for so-called [toro] that oil got on. It is an admission of a plain muscle plate to echo high in addition to a resemblance to this, there is a case of the frozen scorch, and a high crude echo not uniform (The reverted image is not shown) like the heavy line. The improvement of a clear ultrasound transmission is seen. A blood combination abnormal and high luminance ..saying.. reflections of the vicinity of edge field and the multiple reflection artefact is generated the remarkable appearance of the expansion of the area to the high echo ..it is the blood combination.,, and happening of making plainly to the boundary with a surrounding muscle the meat scorch that happens on a natural site. The appearance of the abnormal signal in the interruption disappearance of the depth muscle meat and the spine surroundings and the appearance of crude frosted glass externals to echo to the deep body high or a continuous muscular echo that not is are admitted and a septum muscle film plain continuous thickening is seen. When these are observed combining, the possibility of the scorch (protein thermal coagulation change) is suggested.

It might be said the scorch that causes the cloudiness of the shade from the fleshy substance besides this, the quality degradation that rages too much and changes in quality in the state of the lactic acidosis exists, and it resembles the supersonic wave image of the tuna with good quality in the state that a muscular living shuts well. The failure that catches a so-called round scorch as a senior quality is caused when misjudging. It is the most important three-dimensionally to understand the space and to analyze not the plane image evaluation as measures of the failure but plane images in real time obtained and devotes to an original concept of evaluation by the supersonic wave. The evaluation of scorch in the ultrasound evaluation is an important item that puts the thing that not is in the mind.

4 About the instrumental technique used

Most efficiently in the multi frequency of supersonic wave frequency 5Mhz, 7Mhz, and 10Mhz in consideration of mobility in the space with a wide distort little, linear type probe and auction market without the commercial power sources because the tuna quality evaluation that was this purpose aimed at the evaluation of the scorch in the depth of the tuna of 80-kilo class mainly from 30 of the specimen materials in the size, it is 50 millimeters in linear type probe HLS-3275 slice direction, 10 probe thickness ?, and PRF? in the device and the main body made of the electron HS-1500 of Honda that also lightly operates weight with built-in the battery in an original power supply in a portable type. It changed to dynamic range 75db and a wide-ranging step setting by

100nsec, acoustic power 0.4mW or less, and 160mm(tuna observation limit 80 kilos) in the maximum in Fresnel zone $L=D^2/4\lambda$ ($\lambda=300,200,150\mu m$) observation depth in 5MHz, and as for the focus setting, up to single focus was selected by half the depth of the observation depth, and the changeable adjustment setting of adoption STC Gain was both changeable method to focus according to the purpose according to the situation. The oscillator material attached importance to Q value and energy efficiency that was higher than the spatial resolution by using PZT. It did not change in the speed of sound setting of the device. The speed of sound of the organization was corresponding a molecular composition such as moisture, fats (It is oil in the fish), and the proteins, almost guessed most agreements, actually corresponding to the guess with the human body by the thing with the same as the reason, and it was in the range from about 1400 to 1600m speed of sound.

6 Method of scanning supersonic wave probe

Figure 3 shows the manner of operation that considers only the picking up evaluation.

6—a Notes before it inspects it

The jelly doesn't use the principle. Original tuna's surface mucus is used.

Only the direction of the arrow is scanned. It scans repeatedly in case of the paucity of information. It is informational in the repetition of the point movement and fan scanning ..the little movement... do not take the slided scanning ..the taboo (The scale stands and there is a likelihood of injury in the probe surface protection film).. the opposite direction

It works for the collection.

6—b Scanning procedure

6-b-1 It is assumed to be basic to do the running through observation and the crossing observation from the head side of the starting point chest Position of four root tail side root of a green arrow without fail toward the tail side. The disorder of being the blood combination and the boundary with surroundings are observed. As for the confirmation of the bloody pulling out processing, the air mixing opinion is picked up from the pinna pectorale root to arterial main where four horizontal finger is observed easily from three most.

6-b-2 The running through observation and the crossing observation are done from the starting point siding of a yellow arrow toward above.

When a zonal, high luminance multiple muscle, especially the reflection is admitted, flaking off and exudate of the body are suggested. The ultrasound transmission of the

depth is observed by the reflection brightness of the spine, presence and the head side of the high luminance spine double line reflection observe the length axis crossing rotation scanning to an inside bone in no echo, and a septum muscle film properties muscle, especially doing making to zonal and interrupted wave presence are observed continuously. In addition, the change of zonal of an inside bone and the septum muscle film continuous it is observed.

The deep protein thermal coagulation (sound impedance change) and properties (liquid or piece shape) change situation can almost be confirmed by adding this method.

6-b-3 The probe is inserted from the cut on a red arrow and the belly side in the intraperitoneal and it observes it. In this case, it is assumed the observation only of the determination of the arrow, and doesn't do the transverse scan. Because the possibility of damaging the probe is high, excessive pressure is not applied though information on the meat scorch can be obtained most. However, information with the highest accuracy can be obtained. There is a fault that becomes a window shade scanning.

6-c-1 Scanning procedure chart

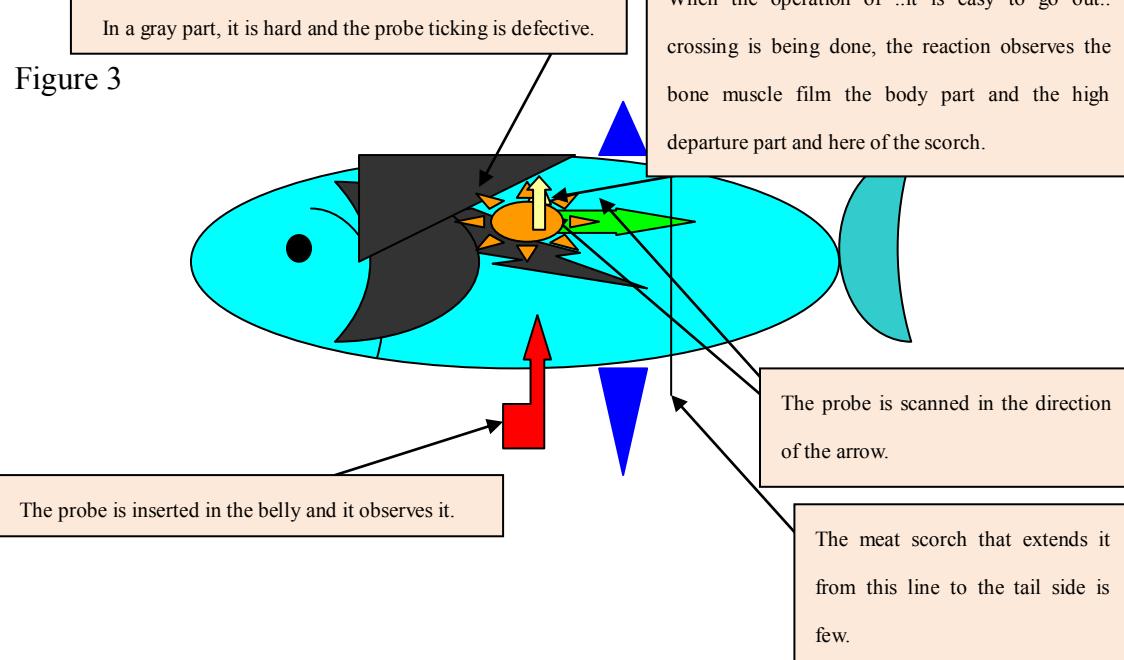
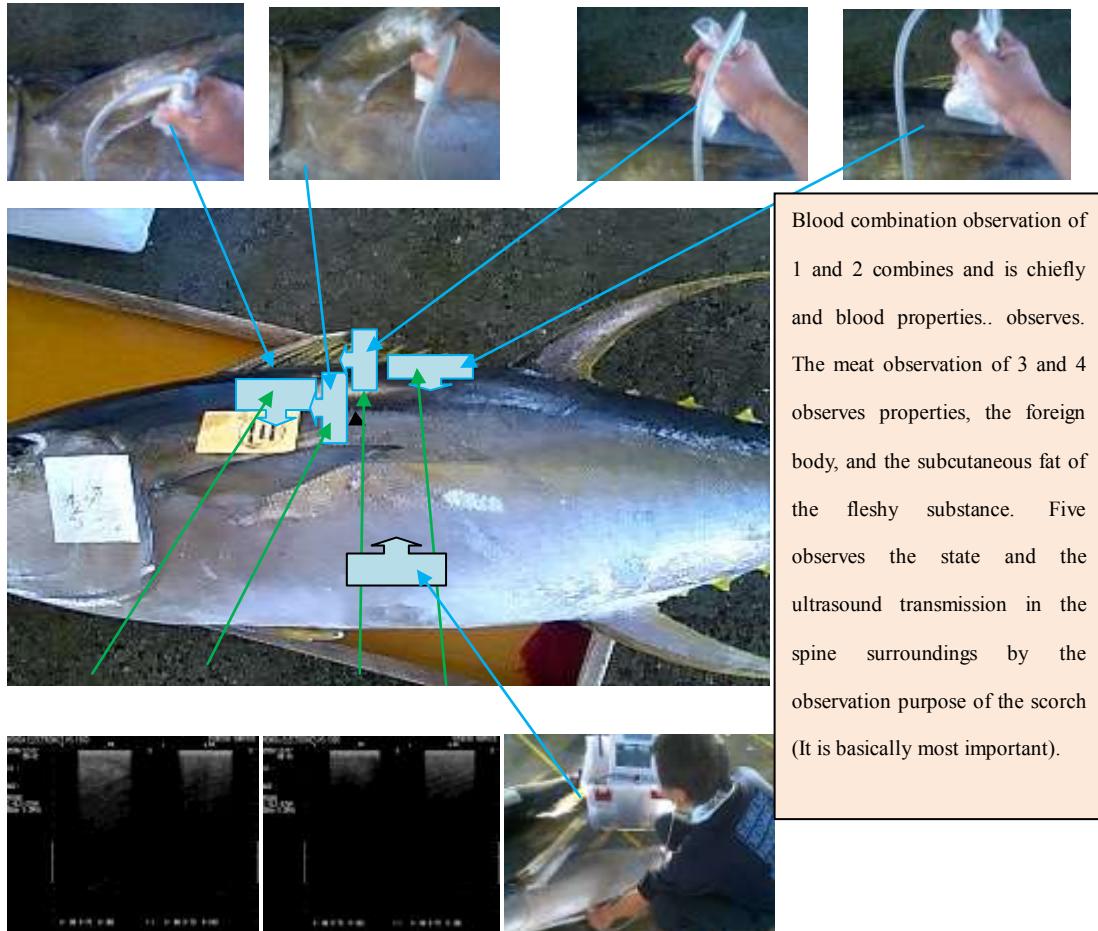


Figure 3

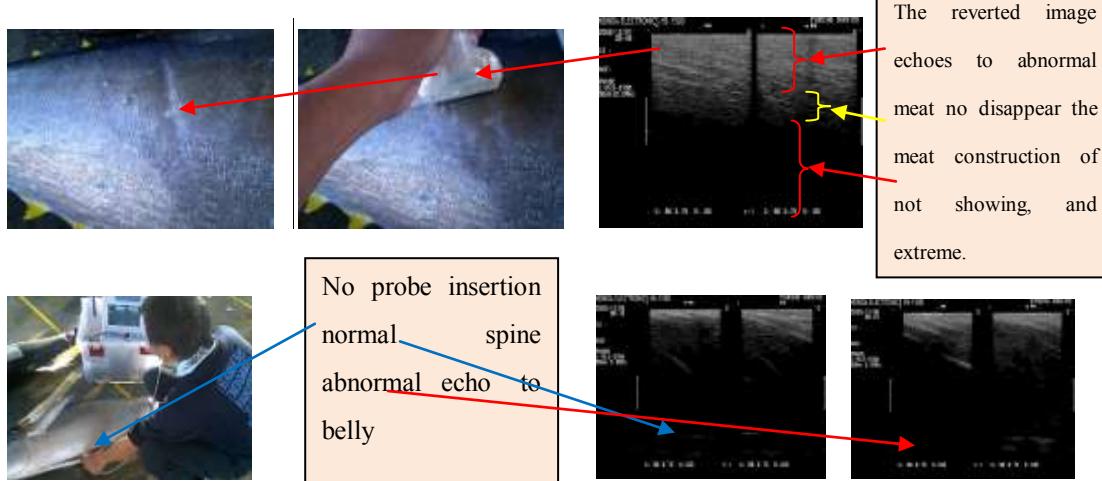
6-c-2 Scanning procedure

- 1 Scanning of sagittal of blood combination 2 Scanning of axial of blood combination
 3 Scanning of axial of muscle 4 Scanning of sagittal of muscle



5 Belly inside insertion scanning

Abnormality part of externals → 10MHz expansion observation → No crude uniformity of abnormal ultrasound imagery



6—c-3 Scanning procedure outline

①Scanning of sagital of blood combination

The probe is hit in the direction of the spindle, and the description of the bone of the spine is observed about the boundedness of muscle and myomere reaching observation depth it is the blood combination and a surrounding fleshy substance the position and Pinna pectorale Position of four root tail side sagital

②Scanning of coronal of blood combination

The probe is hit in the direction of the spindle, and the description of the bone of the spine is observed about the boundedness of muscle and myomere reaching observation depth it is the blood combination and a surrounding fleshy substance the position and Pinna pectorale Position of four root tail side horizontal finger

③Scanning of coronal of myomere

②It drinks, it is Position of four root tail side horizontal finger, the probe is moved in the direction of Fleshy substance following a horizontal scanning, the description of a boundedness of muscle and myomere reaching observation depth and a surrounding body bone of the spines is observed, the echo reflection of back paragraph spine back is observed, and the echo level forward of the spine is observed especially. Because the multiple reflection noise appears easily by the influence of the scale, the technique for inclining the ultrasonic beam in the direction of the slight head tail is required.

④Scanning of sagital of myomere

③The twist is put in the direction of the spindle while drinking and observing the ultrasonic probe at the position of the usualness fleshy substance side scanning and it observes it enough. Especially, the description of the echo level and the echo the spine forward of an inside bone and the septum muscle film is observed. Because the multiple reflection noise appears easily by the influence of the scale, the technique for inclining the ultrasonic beam in the direction of the slight head tail is required in the vertical direction.

⑤Belly inside insertion length scanning

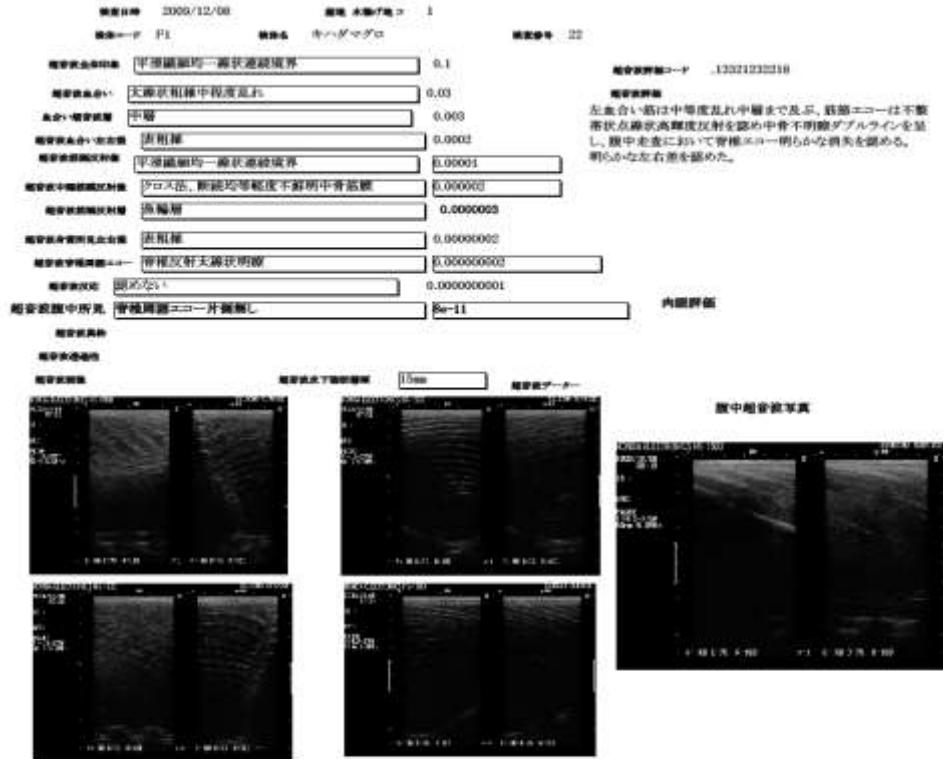
A right and left difference of the deep fleshy substance is observed by inserting the probe in the intraperitoneal from crack respect for the internal organs removal, and scanning to the spine ..parallel.. fan in the direction of the spindle. Because the meat scorch is different the concept with the naked eye judge that cannot be fixed though the limitation of the window shade scanning and the spindle limitation scanning is received even if it does with this though it is an important scanning that enables the evaluation of the deep fleshy substance most, the expression said the meat scorch in the tuna ultrasonography is undesirable. Because a strong meat scorch intercepts the ultrasound

transmission as a point of the observation, the deep traveling direction is observed by no echo, and can suggest the fleshy substance change from the area especially in making indistinctly and the disappearance of the spine bone echo. A defective trouble for the probe sticking of the processing hangover (ovary and testicle) occurs easily though measures of the artefact of the scale are none at all.

6-d Opinion input

The database software was narrowed to topics of research by using file maker professional 9 and constructed only with piece person's of me idea. The data input item set an important item ten places and the reference item four places as shown in the following. The evaluation code has been installed according to the input value. However, it is in the state that has not been arranged yet. It is finally finishing it up in a good opinion for the order with a low numerical value. Because the numerical value is encoded as for the quality rating now, the ultrasonographic observation can be transmitted to the other party side only by displaying the numerical value.

All input data is accumulated in the data base and the accuracy of the inspection and the standard grows up according to the data accumulative amount because it can do all the analyses, the retrievals, and relations.



The impression from which the impression of the entire supersonic wave image is caught first is input. The state it is the blood combination is input. The depth of the layer that can be observed is input. A right and left difference is observed and it inputs it.

The following items are input thus one by one. The inspection equipment and the data base personal computer are displayed before the input, and the thing in real time input is preferable.

Note) The analytical result to which the space is constructed is assumed to be a difficult reflection when inputting it collectively after the inspection ends.

7 Method of analyzing ultrasonography data

The blood combination in the back boundary part on the yellow fin tuna the higher rank of the quality back shows ultrasound wave B mode image 4 saying.